



## Instruction Manual



Author	Department	Changes	Version	Date
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Initial release	0.1	15.02.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Revision of all chapters	0.2	05.03.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Revision of pictures	0.3	19.03.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Revision of pictures, FW	0.4	25.03.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Addition of MODBUS	0.5	10.04.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	MODBUS modifications	0.6	18.05.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Various modifications	0.7	29.06.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Various modifications	0.8	12.08.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Various modifications	0.9	16.09.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Release version	1.0	29.01.2010
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Addition of IEC103/REG-PE(D)	1.1	10.05.2010
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Various modifications	1.2	20.08.2010
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	DNP3/REG-PE(D) over Ethernet	1.3	19.10.2010
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	IEC104 with 5 partner stations	1.4	14.02.2011
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	IEC103 full revision	1.5	05.05.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	IEC61850 full revision	1.6	26.05.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	IEC61850 IED name configuration	1.7	11.06.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Update to Version 9.9, versioning now same as WinConfig.	9.9	13.09.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension to new doc guidelines.	9.9.1	13.10.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	New SCL_Config	9.9.2	13.12.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension of Modbus and RPL.	9.9.4	01.03.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension of IEC 104.	9.9.5	08.03.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension to PRP V0	10.5.2	28.11.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension to PRP V1	10.5.3	12.12.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension to Cyber Security Version	11.0.0	23.12.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension with IEC 60870-5-101	11.0.1	23.05.2014
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Cyber Security adjustable, IEC 61850 Ed. 2	11.0.2	23.07.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension of IEC 61850 client functionality, Grouping in IEC 60870-5-104	11.0.3	10.09.2014
Wolfgang Borchers	<a href="mailto:wolfgang.borchers@a-eberle.de">wolfgang.borchers@a-eberle.de</a>	Various modifications	11.0.6	08.10.2015

# Table of Contents

<b>1.</b>	<b>User Guidance.....</b>	<b>10</b>
1.1	Warnings .....	10
1.2	Notes .....	10
1.3	Other Symbols.....	10
<b>2.</b>	<b>Scope of Delivery .....</b>	<b>11</b>
2.1	Scope of Delivery .....	11
<b>3.</b>	<b>Supported Software .....</b>	<b>11</b>
<b>4.</b>	<b>Introduction.....</b>	<b>13</b>
<b>5.</b>	<b>Glossary.....</b>	<b>14</b>
<b>6.</b>	<b>WinConfig REG-P / REG-PE / REG-PED .....</b>	<b>14</b>
6.1	WinConfig Software introduction .....	14
6.1.1	Mohican server TCP port management and WinConfig logging.....	15
6.2	REG-PEX Loader software .....	17
6.3	Communication with REG-PE(D) telecontrol board in WinConfig 11 .....	18
6.3.1	Rules for higher security .....	19
6.3.2	SFTP access.....	19
6.3.3	Actions supported by firmware and their usage: .....	21
6.3.4	SSH access .....	22
6.3.5	Menu and meaning of individual items: .....	22
<b>7.</b>	<b>Supported protocols and telecontrol board types .....</b>	<b>25</b>
<b>8.</b>	<b>Introductory window .....</b>	<b>26</b>
<b>9.</b>	<b>Work with protocol settings .....</b>	<b>26</b>
9.1	Settings tree .....	27
9.2	Main menu buttons .....	28
9.2.1	New settings.....	28
9.2.2	Open, conversion from INI, import from Excel .....	29
9.2.3	Remove, Save .....	30
9.2.4	Transfer settings from / to a PC, explained .....	30
9.2.5	Remarks to all Ethernet data transfers.....	32
9.2.6	TK400 telecontrol board: .....	32
9.2.7	TK8xx telecontrol board:.....	32
9.2.8	Transfer settings from PC function .....	34
9.2.9	Transfer settings from PC function for telecontrol boards type REG-PE(D) .....	35
9.2.10	Transfer settings to PC function.....	38

9.2.11	Change of IP settings for REG-PE(D) telecontrol boards .....	40
9.2.12	Submit certificates for REG-PE(D) telecontrol boards .....	41
9.2.13	Bonding .....	43
9.2.14	PRP - Parallel Redundancy Protocol .....	43
9.3	Compare settings function .....	44
9.4	Rules for export/import using Microsoft Excel .....	45
9.4.1	Export to Excel .....	45
9.4.2	Import from Excel .....	45
9.5	Migration of settings .....	46
9.6	Checking of entered values .....	46
<b>10.</b>	<b>IEC101 settings.....</b>	<b>47</b>
10.1	Basic.....	47
10.2	Advanced.....	49
10.2.1	IEC101 Settings - SCADA for REG-P telecontrol boards.....	49
10.2.2	IEC101 Settings - SCADA for REG-PE(D) telecontrol boards.....	53
10.2.3	ComServer settings .....	55
10.2.4	ComServer settings, IEC101 for REG-PE(D) .....	56
10.2.5	Supervisory settings, IEC101 for REG-PE(D) .....	56
10.3	Linked devices .....	56
10.3.1	Time synchronization .....	57
10.3.2	Internal communication.....	58
10.3.3	Converter Errors .....	59
10.4	Device x .....	60
10.4.1	Device request settings .....	60
10.4.2	Indications .....	62
10.4.3	Commands .....	65
10.4.4	Editing the IOA in columns .....	67
10.4.5	Status.....	68
<b>11.</b>	<b>Settings – SCADA for IEC103 (REG-P).....</b>	<b>71</b>
11.1	Advanced.....	71
11.1.1	Settings – SCADA .....	71
11.2	Devices .....	73
11.2.1	Converter Errors .....	73
11.3	Device x .....	73
11.3.1	Device request settings .....	73
<b>12.</b>	<b>IEC103 settings (REG-PE(D)) .....</b>	<b>75</b>

12.1	Common.....	75
12.1.1	IEC 60870-5-103-Conformity .....	75
12.1.2	Supported Type Identifications.....	75
12.1.3	Supported Cause of Transmission.....	76
12.1.4	Topical channel (ACC) .....	76
12.1.5	Fault Number (FAN) .....	76
12.1.6	Interval between information elements (INT).....	77
12.1.7	Compatibility level (COL).....	77
12.1.8	Number of channels (NOC) .....	77
12.1.9	Number of information elements of a channel (NOE).....	77
12.1.10	Number of tags (NOT).....	77
12.1.11	Number of relevant disturbance values per ASDU (NDV) .....	77
12.1.12	Return information identifier (RII) .....	77
12.1.13	Scan number (SCN) .....	77
12.1.14	Supplementary information (SIN).....	77
12.1.15	Status of fault (SOF) .....	78
12.1.16	Tag position (TAP) .....	78
12.1.17	Type of order (TOO) .....	78
12.1.18	Type of disturbance values (TOV) .....	78
12.1.19	Binary time.....	79
12.2	Basic settings.....	79
12.3	Advanced settings .....	81
12.3.1	IEC103 Settings – SCADA for PQI-D device .....	81
12.3.2	IEC103 Settings – SCADA for EOR-D device .....	85
12.3.3	Ethernet-COM-Server .....	87
12.3.4	ComServer settings PQI-D.....	89
12.3.5	ComServer settings EOR-D.....	93
12.3.6	Supervisory settings.....	95
12.4	Devices .....	98
12.4.1	Time synchronization PQI-D.....	98
12.4.2	Time synchronization EOR-D.....	99
12.4.3	Internal communication PQI-D .....	100
12.4.4	Internal communication, EOR-D .....	102
12.5	Device x .....	104
12.5.1	Device settings .....	104
12.5.2	Data points – indications, PQI-D .....	107

12.5.3	Indications, EOR-D.....	109
12.5.4	Commands .....	110
12.5.5	Fault records.....	111
12.5.6	EOR-D® defined settings .....	114
12.5.7	Single disturbance value (SDV).....	114
<b>13.</b>	<b>IEC104 settings.....</b>	<b>115</b>
13.1	Basic.....	115
13.2	Advanced.....	118
13.2.1	Settings - SCADA.....	118
13.2.2	ComServer settings .....	120
13.2.3	Supervisory settings .....	122
13.3	Linked Devices .....	125
13.3.1	Time synchronization .....	125
13.3.2	Internal Communication .....	126
13.3.3	IEC104 Commands .....	127
13.3.4	IEC104 indications .....	128
<b>14.</b>	<b>DNP3 settings (REG-P) .....</b>	<b>131</b>
14.1	Basic.....	131
14.2	Advanced.....	132
14.2.1	Settings - SCADA.....	132
14.3	Device x .....	136
14.3.1	Device request settings .....	136
14.3.2	Commands .....	137
14.3.3	Indications .....	138
<b>15.</b>	<b>DNP3 settings (REG-PE(D)).....</b>	<b>139</b>
15.1	Basic.....	139
15.2	Advanced.....	140
15.2.1	Settings SCADA.....	140
15.3	Device X.....	142
15.3.1	Device request settings .....	142
15.3.2	Indications .....	143
15.3.3	Commands .....	145
<b>16.</b>	<b>CSO settings (REG-P) .....</b>	<b>146</b>
<b>17.</b>	<b>CSO settings (REG-PE(D)) .....</b>	<b>148</b>
17.1	CSO channels.....	148
17.2	CSO Supervisory settings.....	150

<b>18.</b>	<b>Modbus settings .....</b>	<b>151</b>
18.1	Basic settings MODBUS RTU .....	151
18.2	Basic settings MODBUS TCP .....	152
18.3	Advanced - Settings - SCADA.....	153
18.4	Devices .....	154
18.4.1	Time synchronization .....	154
18.4.2	Internal communication settings .....	155
18.5	Device x .....	156
18.5.1	Device settings .....	156
18.5.2	Indications.....	157
18.5.3	Commands .....	158
<b>19.</b>	<b>C37.118 Settings.....</b>	<b>159</b>
19.1	Basic .....	159
19.2	Advanced.....	160
19.2.1	Serial Port Assignment.....	160
19.2.2	Settings – SCADA.....	161
19.2.3	ComServer.....	162
19.2.4	Supervisory.....	164
19.3	Linked Devices.....	167
19.3.1	Time Synchronization.....	168
19.3.2	Internal communication.....	169
19.3.3	Device x .....	170
19.3.4	Indications.....	171
<b>20.</b>	<b>IEC61850.....</b>	<b>172</b>
20.1	General Information .....	172
20.2	SCL_Config engineering Tool .....	172
20.2.1	Displaying project configuration and properties of nodes .....	174
20.2.2	Displaying source (ICD-file) .....	175
20.2.3	Adding, deleting and renaming devices.....	176
20.2.4	Adding, deleting and renaming logical nodes.....	177
20.2.5	Editing sAddr .....	178
20.2.6	Removing Data Objects.....	183
20.2.7	Restore Data Objects from Template .....	184
20.2.8	Renaming Data Objects.....	185
20.2.9	Changing of DO Data Class.....	186
20.2.10	Changing the control model for controllable data objects.....	187

20.2.11	GOOSE <i>light</i> Support .....	189
20.2.12	Actions log .....	197
20.3	IED-Server Configuration.....	197
20.4	Logical Device Configuration .....	198
20.5	Logical Node Configuration .....	198
20.6	Common Data Attribute Configuration.....	198
20.6.1	Status Value Configuration.....	199
20.6.2	Control Value Configuration.....	203
20.6.3	Set point Value Configuration (Single Command) .....	213
20.7	GOOSE <i>light</i> Settings .....	215
20.7.1	IEC GOOSE <i>light</i> Architecture .....	215
20.7.2	GOOSE <i>light</i> Control Blocks Settings .....	215
20.7.3	GOOSE <i>light</i> Input Streams (Inner Subscribers) .....	217
20.7.4	Publisher Side .....	217
20.7.5	Subscribe Side .....	222
20.8	WinConfig Settings .....	231
20.9	Basic.....	231
20.10	Advanced.....	233
20.10.1	Serial ports assignment .....	233
20.10.2	Settings - SCADA.....	234
20.10.3	ELAN extension (CSE) .....	236
20.10.4	COM-Server .....	240
20.10.5	Supervisory settings .....	242
20.10.6	Time synchronization .....	246
20.10.7	Internal communication.....	249
20.10.8	Attached Devices.....	251
20.10.9	Saving of settings in IEC61850.....	252
<b>21.</b>	<b>WinConfig in Step-by-Step mode .....</b>	<b>253</b>
21.1	Templates in Step-by-Step mode .....	253
21.2	Step 1 - hardware .....	254
21.3	Protocol and templates .....	255
21.4	Protocol-specific settings .....	265
21.5	Time synchronization .....	267
21.6	Devices .....	268
21.7	REGSys configuration .....	268
21.8	Download .....	269



21.9 Finishing ..... 270

**22. Tips on Troubleshooting ..... 271**

22.1 Common troubleshooting tips ..... 271

22.2 Diagnostic Functions in the Context of the REG-P / REG-PE / REG-PED Device ..... 272

**23. Related Documentation ..... 275**

**24. Maintenance/Cleaning ..... 276**

**25. Disposal ..... 276**

**26. Product Warranty ..... 276**

**27. List of Figures ..... 277**

**28. List of Tables ..... 281**

# 1. User Guidance



## 1.1 Warnings

### Types of warnings

Warnings are distinguished according to the type of risk through the following signal words:

- **Danger** warns of a risk of death
- **Warning** warns of physical injury
- **Caution** warns of damage to property

### Structure of a warning

 <b>SIGNAL WORD</b>	<b>Nature and source of the danger</b>  Actions to avoid the danger.
---	--

## 1.2 Notes




Notes on appropriate use of the device

## 1.3 Other Symbols

### Instructions

Structure of instructions:

-  Guidance for an action.
- ☒ Indication of an outcome, if necessary.

### Lists

Structure of unstructured lists:

- List level 1
  - List level 2

Structure of numbered lists:

- 1) List level 1
- 2) List level 1
  1. List level 2
  2. List level 2

## 2. Scope of Delivery

### 2.1 Scope of Delivery

- WinConfig Software, available on FTP: [ftp://a-eberle-user:eberle@ftp.a-eberle.de/public/SCADA/WinConfig\\_11/](ftp://a-eberle-user:eberle@ftp.a-eberle.de/public/SCADA/WinConfig_11/) or at the Download Centre of our Homepage: <http://www.a-eberle.de>
- User Manual
- RS232 cable
- RPL Loader Software, available on FTP: [ftp://a-eberle-user:eberle@ftp.a-eberle.de/public/SCADA/REG-PE\(X\)-Loader/](ftp://a-eberle-user:eberle@ftp.a-eberle.de/public/SCADA/REG-PE(X)-Loader/)

## 3. Supported Software

Table 1: Topical software state at the 2012-10-10

Name	Definitions	
Date	19-09-2012	
Firmware REG-PE	Supported XML settings from WinConfig	
Settings can be found in directory /mnt/jffs2/param	XML settings file	settings.xml
	other files and directories are only temporary generated from settings.xml after each restart	
Images:	Firmware ramdisk: uRamdisk (BusyBox, common libraries and utilities)	
	Kernel: kernel.tgz (Linux kernel for TK860)	
	TK860_DNP3.tgz TK860_IEC104.tgz TK860_IEC103.tgz TK860_MODBUS.tgz TK860_CSO.tgz TK860_C37118.tgz TK860_IEC61850.tgz (protocol specific applications and web pages)	

Name	Definitions	
Date	19-09-2012	
Firmware REG-PED	Supported XML settings from WinConfig	
Settings set in directory /mnt/jffs2/param	XML settings file	settings.xml
	others files and directories are only temporary generated after each start from settings.xml	
Images:	Firmware ramdisk: uRamdisk (BusyBox, common libraries and utilities)	
	Kernel: kernel_16MB.tgz kernel_16MB_SCC4.tgz kernel_32MB.tgz kernel_32MB_SCC4.tgz (Linux kernel for TK885D board with 16 and 32 MB flash)	
	TK885_DNP3.tgz TK885_IEC104.tgz TK885_IEC103.tgz TK885_MODBUS.tgz TK885_CSO.tgz TK885_C37118.tgz TK885_IEC61850.tgz (protocol specific applications and web pages)	

Firmware REG-P			
REG-P Version TK509	IEC101 balanced	25-01-2011	asciireg101B509V4215.hex Version 42.15
	IEC101 unbalanced	25-01-2011	asciireg101U509V4215.hex Version 42.15
	IEC103	04-03-2010	asciireg103_509V4211.hex Version 42.11
	DNP3	16-11-2009	DNP3.hex
REG-P version TK517	IEC101 balanced	25-01-2011	asciireg101BEXTV4215.hex Version 42.15
	IEC101 balanced	25-01-2011	asciireg101BINTV4215.hex Version 42.15
	IEC101 unbalanced	25-01-2011	asciireg101UEXTV4215.hex Version 42.15
	IEC101 unbalanced	25-01-2011	asciireg101UINTV4215.hex Version 42.15
	IEC103	03-03-2010	asciireg103_EXTV4211.hex Version 42.11
	IEC103	10-03-2010	asciireg103_INTV4211.hex Version 42.11
	DNP3	02-10-2012	DNP3EXT.hex
	DNP3	02-10-2012	DNP3INT.hex
REG-P version TK400	IEC101 balanced	25-01-2011	ASCIIReg101B400V5213.hex Version 52.13
	IEC101 unbalanced	25-01-2011	ASCIIReg101U400V5213.hex Version 52.13
	IEC103	12-01-2012	ASCIIReg103_400V5216.hex Version 52.16
	DNP3	23-07-2012	DNP3.hex
	CSO	16-11-2009	CSOv6007.hex Version 60.07
PQI-DA (TK400)	CSO	16-11-2009	CSOv6007.hex Version 60.07

## 4. Introduction

This document describes the configuration of telecontrol boards REG-P / REG-PE / REG-PED / PQI-DA using DNP3, IEC101, IEC103, IEC104, Modbus, 61850, C37.118 and Ethernet/COM in connection with XXXSysTM devices (e.g. REGSys™ or EORSys devices) of a.eberle company.

To understand the ideas and techniques described, you should already be familiar with general concepts concerning the above stated protocols and serial communication settings.

Two methods of configuration may be used: either “online” with connection to the REG-PE / REG-PED, or “offline” using a PC-tool called WinConfig Tools.

The web server is a permanent part of the firmware of the REG-PE / REG-PED devices and requires no special installation.

Web server is also part of the WinConfig offline version.

## 5. Glossary

Combo-Box	A text box combined with a List Box within a software program
FTP	File Transfer Protocol
Group-box	A named rounded box typically enclosing a group of one or more buttons
GUI	Graphical User Interface
HTTPS	Hypertext Transfer Protocol Secure
IOA	Information Object Address
SCADA	Supervisory Control And Data Acquisition
VM	Virtual Machine
TSDU	Telegram Service Data Unit
XML	Extensible Markup Language

## 6. WinConfig REG-P / REG-PE / REG-PED

### 6.1 WinConfig Software introduction

WinConfig is software for managing of firmware and communication protocol settings of telecontrol boards and modules: REG-P / REG-PE / REG-PED placed into a.eberle device racks. WinConfig is a web-based program for creation and management of files containing protocol settings, for two way transfer of settings and firmware from a user PC to REG-P / REG-PE / REG-PED boards and modules, and for identification of REG-P / REG-PE / REG-PED devices connected to the network.

Telecontrol board firmware has to be equipped with COM-Server to identify itself within the network. COM-Server is part of all IEC101, IEC103, and IEC104 protocols installed as firmware and accessible by the WinConfig environment. COM-Server cannot work in TK519 and TK509 REG-P types, because Ethernet connections are not available with these board types.

WinConfig program equipment consists of web server Mohican equipped with active pages for GUI and libraries developed in C# .NET software development environment for communication with telecontrol boards, file services and additional auxiliary functions.

WinConfig prepares settings for REG-P / REG-PE / REG-PED with IEC101, IEC103, IEC104, DNP3 and Modbus protocols and COM-Server on a local host (local web server) and stores them in a standard file format - .XML file. The settings file can then be transferred via

HTTPS to board flash memory in the case of REG-PE / REG-PED board types. WinConfig creates binary data files in Intel HEX format and transfers them into the board memory in the case of REG-P boards. Serial transfer via a.eberle device or Ethernet transfer can be used according to the REG-P type. Firmware is always transferred together with settings, WinConfig use the latest firmware, which is part of its package.

A part of configuration software is also transferred to the telecontrol board and this *online* part provides a system functions focused to the management of telecontrol board system software, user management etc. with high level of security. The functionality of this part of WinConfig is described in a separate chapter.

WinConfig splits into two main parts: the local web server and the local Web site with application libraries. Settings may be prepared, stored and retrieved for various configurations without a direct link to the device.

Settings are saved in .xml file types. WinConfig launches a local web server and a default web browser on your PC.

Should one of the expressions used in this document be unclear to you, you may refer to the glossary at the end of this document for an explanation of it. Otherwise please feel free to contact us with your technical questions at this email address: [info@a-eberle.de](mailto:info@a-eberle.de).

### 6.1.1 Mohican server TCP port management and WinConfig logging

The default TCP port used by Mohican web server is port 8080. To avoid conflict in the case when this port is occupied, WinConfig always tests whether TCP port 8080 is free. If not, then WinConfig tries to increment the port number and finds the first free port. Such port number is written in the WinConfig configuration file and this number is consequently used for the WinConfig operation. The described test is performed always when WinConfig is launched.

The WinConfig software creates two log files:

- The log files created by C# libraries

These files are created in the WinConfig installation folder and are named according to the format *YYYY.MM.DD.WinConfig.log*, where YYYY.MM.DD is date of the log file creation. The maximum depth of the log files is 10 days, older files are deleted when WinConfig is launched.

- The log files created by Mohican web server

The logging created by Mohican web server is switched off by default. The logging can be switched on by editing the following line in the *Mohican.conf* configuration file placed in the WinConfig installation folder:

```
<Logging state="off">../log/httpserver.log</Logging>
```

To switch the logging on, change the *Logging state* option to "on". The option allows also setting of the log file name and folder. In the above stated example the log file name is *httpserver.log* and will be created in the */log* subfolder of the WinConfig installation folder.

We take care of it.

---



## 6.2 REG-PEX Loader software

The REG-PEX loader (RPL) is software tool for transfer of Linux Kernel and RAM disk into the REG-PE(D) and PQI-DA telecontrol boards equipped only with U-Boot software. Such boards cannot cooperate directly with WinConfig. The RPL also allows change of board IP settings and selection of kernel with/without the bonding feature.

*The RPL is low-level software tool and should be used by advanced users only.*

The RPL software is contained in the WinConfig installation package and can be launched from *Transfer from PC* page by the *Run RPL* button. The WinConfig also offers launch of RPL in the case when no REG-PE(D) telecontrol board is detected.

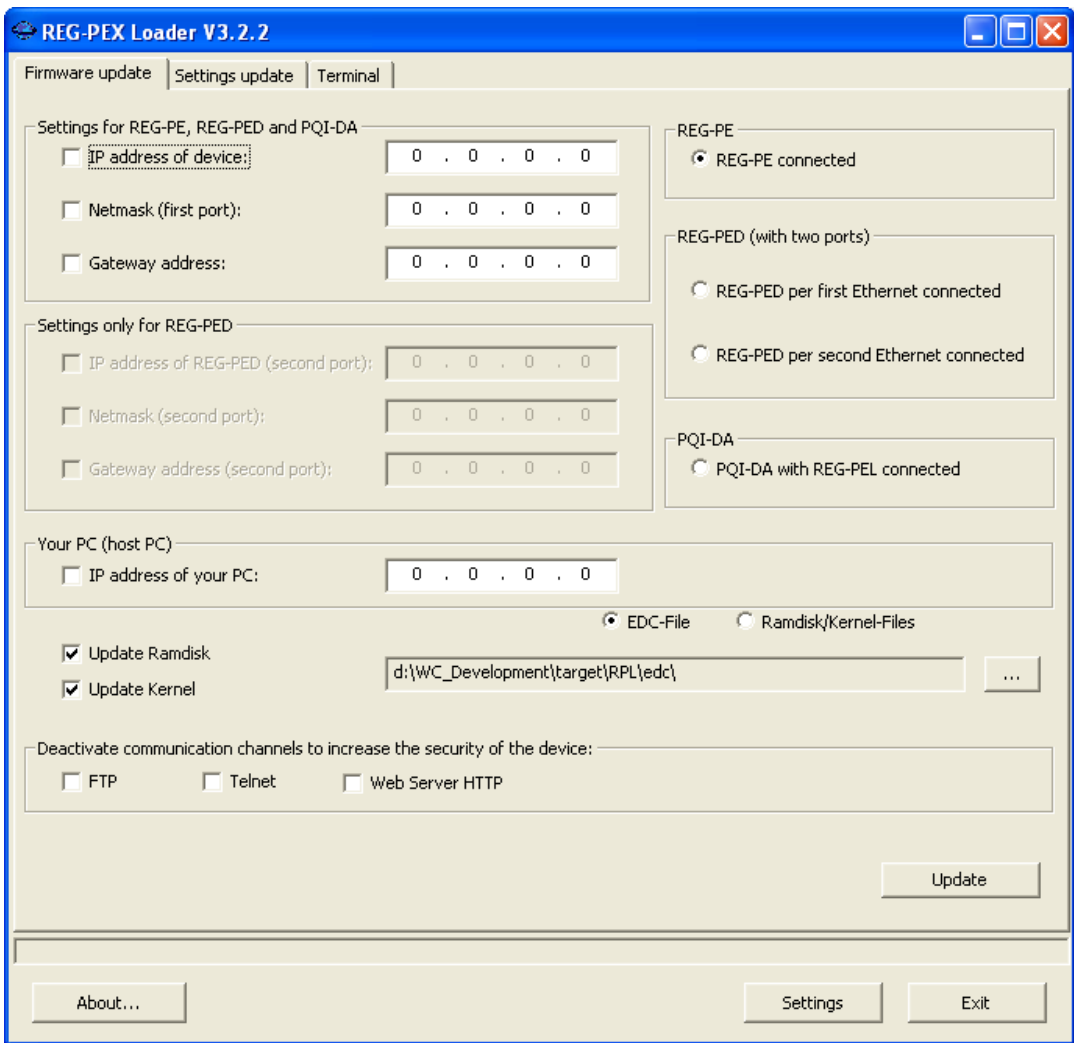


Figure 1: The RPL window

To transfer Linux Kernel and RAM disk into the REG-PE(x) follow these steps:

- Connect the PARAM connector of REG-PE(x) board and your computer with the RS232 cable supplied with the eberle device or with any serial null modem cable.
- Connect your computer and the REG-PE(x) board by Ethernet cable. Some Ethernet adapters do not switch to the correct mode automatically, so please use preferably a crosslink patch cable.
- Fill the IP address lines in RPL window.
- Use the (...) button to browse the edc file placed in the WinConfig installation folders. There are two edc files distributed in the WinConfig setup, the difference is in the versions of Kernel - with/without support of bonding. Select whatever of the two files as bonding and related features can be set later using the *Change of IP settings for REG-PE(D) telecontrol boards* WinConfig function.
- Press the *Update* button. The update process can be seen in the RPL tab *Terminal*.

## 6.3 Communication with REG-PE(D) telecontrol board in WinConfig 11

A higher level of security for data transfer and communication with REG-PE(D) telecontrol board is used in WinConfig v.11. The online WinConfig (www pages placed in the board memory) can be disabled in the *Transfer settings settings from PC* page in offline WinConfig or in the *REG-PE(D) board IP settings* page in online WinConfig or in user menu.

The new firmware supports several functions as described below.

The following secured communication technologies are used in WinConfig 11:

- SFTP (SSH file transfer protocol) replaced the online WinConfig. The v.11 firmware supports several functions focused to file transfer. The file transfer via SFTP protocol is encrypted and protected by user login and password; *remoteuser* login can be used with *remoteuser* password (factory default).
- SSH is used instead of former telnet for remote access to console. This access is typically used for basic board configuration. A SSH client (e.g. PUTTY) is necessary for this type of connection.
- HTTPS (HTTP over SSL) together with SSL certificates is used for communication between off-line WinConfig and telecontrol board.

#### *Note on HTTPS accounts functionality when upgrading/downgrading from/to WinConfig 10*

When user upgrades from WinConfig 10 to 11 using offline WinConfig, one of the HTTPS accounts (username and password) from version 10 (passwords coded by XOR, not by SHA2 hash) is used. The accounts defined in the version 10 coded by XOR remain in the upgraded version 11. The individual account is changed to the new SHA2 coding version in the moment when user changes this account in the WinConfig 11.

The file with SHA2 coded accounts remains in the telecontrol board when downgrading from version 11 to version 10. Offline WinConfig 10 using XOR password coding will not work in such case. To solve such situation, the user can change the accounts using FTP or serial PARAM port or to delete the account file `/mnt/jffs2/config/webs_users.conf`. When the file is deleted, the default account will be used.

### **6.3.1 Rules for higher security**

It is strongly recommended to switch off at least the online WinConfig and change the factory default passwords to get highest security concerning data and software stored in telecontrol board.

User should also disable all network services that are not necessary for the board operation and management, namely SFTP, SSH and HTTPS (WinConfig).

When creating new user password, keep also in mind the basic rules for secure passwords:

- Password should be at least 8 characters long
- Use uppercase and lowercase letters
- Use also numbers
- Use also special characters like `$#&`.

For more information about secure and strong passwords please consult the publicly available information in the Internet.

### **6.3.2 SFTP access**

A SFTP (SSH file transfer protocol) client program has to be used for connection with telecontrol board and for transfer of files between board and PC computer, e.g. WinSCP for MS Windows, GFTP for MS Windows and Linux or, possibly, SFTP (PSFTP) for the command line mode.

The following files can be found in the board memory and transferred to PC:

- current XML settings
- ICD file for 61850 protocol

- files with information about hardware, SW version, system kernel log etc.

The XML settings and ICD file are placed in the */xload/actual* folder and files with information about HW etc. are placed in the folder */xload/info*.

The XML settings and ICD file can be replaced and thus new configuration can be installed using SFTP. It is also possible to transfer SSL certificates with key that are used for HTTPS communication with WinConfig or to change debugging (logging) parameters as defined in the *Supervisory* page of WinConfig. The debugging (logging) parameters can be changed without need of board restart. However, the most of parameter changes require restart of board that can be also done via SFTP.

Use always the */xload/new* folder when transferring files from PC to board. The */xload/new* folder is scanned by firmware approximately every 20 seconds and firmware starts required action in the case when relevant files are found in the folder.

### 6.3.3 Actions supported by firmware and their usage:

- **Restart of board**
  - Prepare empty file named *reboot* and copy it in the */xload/new* folder.
  - Wait approx. 20s for the automatic restart of board.
  
- **Installation of new XML settings and ICD file**
  - Prepare new settings file named *settings.xml* and copy it in the */xload/new* folder.
  - Prepare new ICD file (if ICD change is required) and copy it to the folder.
  - Prepare empty file named *move* and copy it.
  - Wait approx. 20s for the automatic move and installation of the files.
  - Prepare empty file named *reload* and copy it.
  - Wait approx. 20s for the automatic reload of files transferred in the previous sequence. Reload can be used if there was change in the supervisory parameters only. Otherwise use *restart*, see item 1.
  
- **Installation of new certificates**
  - Prepare device certificate in the *cert.pem* file and copy in the */xload/new* folder. The certificate has to be in the PEM format.
  - Prepare and copy also the key as *key.pem* file.
  - If required, prepare and copy also the intermediate certificates as *intercert.pem* file. The certificates must be in PEM format and must be sorted starting with the certificate to the highest level (root CA).
  - Alternatively, the CA certificate can also be copied as the *cacert.pem* file.
  - Prepare empty file named *cert\_move* and copy it in the */xload/new* folder.
  - Restart the board, see item 1.

### 6.3.4 SSH access

SSH is used for remote access to console. The file transfer is encrypted and protected by user login and password; *remoteuser* login can be used with *remoteuser* password.

The access is driven by sequence of user menu that allow user to show and/or change the board settings of to show logs of kernel, system and applications.

### 6.3.5 Menu and meaning of individual items:

#### Main menu

1. Network menu
  - *Go to menu for network setting and diagnostic*
2. Services menu
  - *Go to menu administration of network services (SSH/SFTP, HTTPS)*
3. Log menu
  - *Go to menu showing logs*
4. Change terminal password
  - *Change of SSH and SFTP passwords. Change is applied to the currently logged user. Program asks for entering of old password and two times new password. Attention, a change is applied immediately.*
5. HTTPS users management
  - *Go to administration of HTTPS users (off-line WinConfig)*
6. Logout
  - *Terminal logout*
7. Reboot
  - *Restart telecontrol board*
8. Recovery menu
  - *Go to recovery mode. This menu item is shown only in the case of access via local serial port. Another condition is that the board has to be prepared for the recovery mode (the R key is pressed in the moment or recovery notification during the card restart).*
9. Start root shell
  - *The root shell is determined only for administrators and is not available for remoteuser and localuser.*

## Network menu

1. Ping ICMP
  - *The ICMP ping is determined for the diagnostic of network connection. The system asks for counterparty IP. The ICMP echo-request packet is used. The user network interface is determined by routing table.*
2. Ping ARP
  - *The ARP ping is determined for the diagnostic of network connection within one subnet. The system asks for counterparty IP and, if there is more network interfaces (TK885), it asks also for the interface to be used. This ping usually passes through firewall. The ARP protocol is not routed to other networks.*
3. Show routing table
  - *Shows current routing table.*
4. Show interfaces
  - *Shows current list of network interfaces with parameters (IP address, mask, MAC address and statistics of sent and received data).*
5. Show saved network parameters (IP addresses, bonding)
  - *Shows network parameters (IP address, mask, gateway, state of bonding) saved in the flash memory. These parameters will be used after board restart.*
6. Set network parameters (IP addresses, bonding)
  - *Setting of network parameters (IP address, mask, gateway, state of bonding) solved as a series of questions and answers.*
7. Back
  - *Go to main menu.*

## Services menu

1. Services state
  - *Shows the state of SSH/SFTP and HTTPS services (enabled or disabled).*
2. Enable SSH/SFTP
  - *Enables SSH/SFTP service. The change takes effect after board restart.*
3. Disable SSH/SFTP
  - *Disables SSH/SFTP service. The change takes effect after board restart.*
4. Enable WinConfig (https, network detect)
  - *Enables services necessary for the communication with off-line WinConfig. The*

*change takes effect after board restart.*

5. Disable WinConfig (https, network detect)
  - *Disables services necessary for the communication with off-line WinConfig. The change takes effect after board restart.*
6. Enable WinConfig WWW pages
  - *Enables WinConfig WWW pages.*
7. Disable WinConfig WWW pages
  - *Disables WinConfig WWW pages.*
8. Back
  - *Go to main menu.*

*Attention: when both SSH/SFTP and HTTPS accesses are disabled, it is not possible to connect the board remotely. The local access via PARAM port only is possible in such case.*

#### **Log menu**

1. Application and system log
  - *Shows log with messages from system and from user applications.*
2. Kernel log
  - *Shows log with messages from system kernel.*
3. Back
  - *Go to main menu.*

#### **HTTPS users management menu**

1. List users
  - *Shows list of user accounts for HTTPS service (users of off-line WinConfig).*
2. Change user password
  - *Changes user password. The service asks for old password and two time for the new password. The change takes effect after board restart.*
3. Add new user
  - *Adds a new user account. The service asks for new account name and two times password. The change takes effect after board restart.*
4. Delete user
  - *Deletes existing user account. The service asks for existing user account name.*



*The change takes effect after board restart.*

- 5. Back
  - Go to main menu.

**Recovery menu**

- 1. Reboot and format applications part of firmware
  - Sets the formatting flag and performs board reset. Attention, this service formats the jffs2 area without possibility of recovery. This service is determined for emergency situations only, when the board stuck and there is no other possibility of fix. The off-line WinConfig can be consequently used for transfer of new firmware.
- 2. Back
  - Go to main menu.

**7. Supported protocols and telecontrol board types**

Telecontrol board types	Available protocols	Protocols Accessible via
REG-PE(D) (TK860, TK885,	IEC104; DNP3; Modbus; IEC103; IEC61850; ComServer only (CSO); C37.118	
PQI-DA(TK885-1)	CSO, IEC61850, IEC104, IEC104	
REG-P (TK509, TK517)	IEC101 balanced; unbalanced; IEC103, DNP3	Serial (Write only)
REG-P (TK400)	IEC101 balanced, unbalanced; IEC103; DNP3; CSO	Serial *(Write only) and Com Server (Read and Write)
PQI-DA (TK400)	CSO	Serial *(Write only) and COM-Server (Read and Write)

Further protocols can be implemented on demand, please contact: [info@a-eberle.de](mailto:info@a-eberle.de).

## 8. Introductory window

The following introductory window should appear on your screen after WinConfig is started. The following user actions are available from this screen:

- Select WinConfig language from the combo box in the upper right corner of the window.
- Run the standard setting and data transfer wizard from the *Step-by-Step* button.
- Run complete WinConfig from the *Advanced* button.
- Quit WinConfig using the *Quit* button.



Figure 2: Introductory window

Important note:

If user tries to run WinConfig from read-only medium (CD, DVD), a warning message appears instead of the introductory window..

## 9. Work with protocol settings

WinConfig can be used for creation and modification of communication protocol settings. If the settings file was created by a previous version of generator (e.g. GenReg, INI file) then WinConfig can be used also for conversion of INI file to the XML file of settings used by WinConfig.

The communication protocol settings file can be transferred into the memory of the telecontrol board. WinConfig always appends corresponding firmware code to the settings thus the matching pair of settings and code is always transferred as a pair.

The user can also read the settings from the telecontrol boards and show the settings in the WinConfig window using the transfer to PC function. This function is not available for TK509 telecontrol boards.

## 9.1 Settings tree

WinConfig can have more than one settings open; all settings are shown in tree structure in the left frame of WinConfig window.

The selected settings have an orange background.

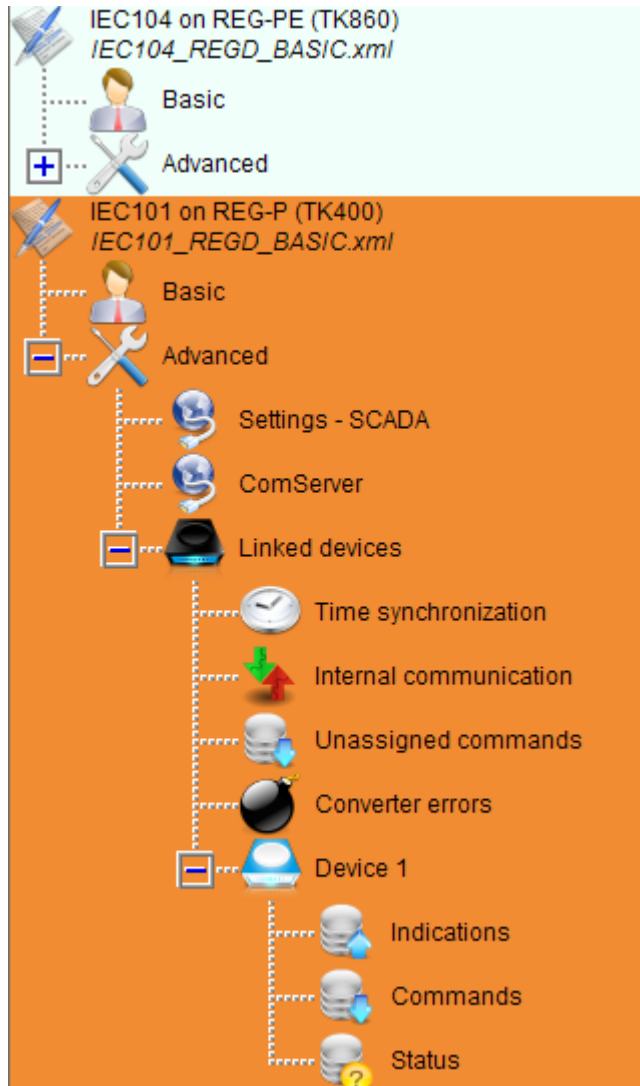


Figure 3: Settings tree

Each setting can be drilled down to sets of editable pages. Clicking the text in the tree structure selects the corresponding page in the right frame of WinConfig window.

## 9.2 Main menu buttons









-  *New* – create new settings based on a default template. User has to enter desired telecontrol board type, protocol, SCADA and device template. WinConfig creates new settings according to the selected options. If the selected SCADA and device template are not defined in WinConfig, a default template will be used instead. (Default settings are based on successful experience in the field and should only be changed if there is good reason to do so).
-  *Open* – open existing XML settings file or open then convert an existing INI settings file to the newer XML settings format. User has to enter/browse the required settings file and enter the target type of the telecontrol board in case of conversion from the older INI format.
-  *Remove* – remove selected settings from the tree in the WinConfig window. Selected settings are marked with an orange background. To select settings click the root node of the settings in the tree (e.g. DNP3 on REG-P (TK400))
-  *Save* – save the selected settings to the XML file on local disk.
-  *Compare* – comparison of settings in XML files with results stored in Microsoft Excel XLS file.
-  *Export* – export of selected settings to a Microsoft Excel XLS file.
-  *Transfer to PC* – transfer settings from a connected telecontrol board to WinConfig as described above.
-  *Transfer from PC* – transfer selected settings from WinConfig to the connected tele-control board as described above.



Figure 4: Main menu buttons

### 9.2.1 New settings

To create new settings from an existing template, please click *new* button. Select board type, protocol, SCADA template and devices template from combo boxes shown below then click the *Add* button. These newly created settings will appear in the settings tree.

The setting templates are divided into two editions in the case of IEC 61850 protocol. The edition of template can be chosen in the *Template edition* listbox. This listbox is disabled in the case of other protocols.

Add new settings

Add new settings from template

Board type:

REG-PED

Protocol:

DNP3

Template edition:

SCADA template:

Basic

Attached Eberle devices:

1x REG-D(A)

Continue

Figure 5: Add new settings

### Predefined templates

Valid workable combinations of board\_type / protocol / SCADA\_template / Devices\_template are pre-defined in WinConfig. However, the default template files, which can be created, exist only for valid combinations already used and known. If a template for a given combination is not available, a warning message will appear onto the screen:

**Template file isn't implemented for chosen combination protocol/SCADA/Eberle devices!  
Default template will be used!**

If the Continue button is pressed apart from invalid combinations, a default template will be used to create the new set of settings. Default templates typically contain basic configurations without pre-defined data points or commands.

## 9.2.2 Open, conversion from INI, import from Excel

### Open Settings from file (XML settings)

In Order to open an existing XML settings file, convert an existing INI file or import a WinConfig-exported Excel file, please click the Open button. To open existing settings please browse the settings file by using the Browse button and then click the Open button in the Open settings from file Group-box

### Convert settings from GenReg "\*.ini" file

To convert settings from GenReg INI format, browse the file by using the Browse button, select required telecontrol board type from combo box and click the Convert button in the Convert settings from GenReg "\*.ini" file frame. WinConfig will automatically detect the protocol described in the INI file and converts the settings to a suitable format for the required board type.

### Import settings from WinConfig-exported Excel file

To import settings from WinConfig-exported Excel file, browse the file by using the Browse button and click Import button in the Import settings, from WinConfig-exported Excel file frame.

**Open settings**

Open settings from file

XML file name:

ICD file name:

Import settings from WinConfig-exported Excel file

Import from external sources

Board type:

Open settings from application TAR file:

Convert settings from GenReg '\*.ini' file:

Figure 6: Open settings

### 9.2.3 Remove, Save

Click the Remove button to remove the selected settings from the settings tree.

Click the Save button to save selected settings to a WinConfig XML settings file. Select folder and type the settings file name in the dialog box.

### 9.2.4 Transfer settings from / to a PC, explained

The following ways of data transfer are available:

- Serial transfer via a.eberle device (for example a REG-D regulator) using serial booter firmware saved in the telecontrol board memory (available for boards TK5xx and TK400)
- Ethernet TCP transfer using Ethernet bbooter firmware saved in the telecontrol board memory (available for TK400 boards). Ethernet transfer can be used in local mode with manual board reset or in remote mode with automatic reset (available for TK400 telecontrol boards with COM-SERVER or CSO firmware installed).
- Ethernet HTTPS transfer (available for TK8xx telecontrol boards).
- Direct access to board memory (if running WinConfig directly in the TK8xx board).

### Transfer communication protocol settings from PC

Transfer from PC to telecontrol board can be performed in the following ways depending upon the types of telecontrol board and application program:

- Transfer via a serial connection of a.eberle device for telecontrol board types TK517, TK509 and TK400 via *Manual transfer from PC button*. User has to enter COM port number of connected PC and manually set the a.eberle device and telecontrol board to the serial down/upload state before transfer can begins.
- Transfer via local Ethernet connection for TK400 board type by *Manual transfer from PC button*. Telecontrol board has to be manually reset by reset button on TK400 board to run Ethernet booter so this way of data transfer is usable only if user has access to the a.eberle device rack. WinConfig performs automatic detection of manual reset event of telecontrol board and automatically chooses free IP address within the given subnet for connection with the Ethernet booter. IP settings for TCP connection with Ethernet booter are used only for the current TCP session. In the case of manual Ethernet transfer, the WinConfig function has to be started first and then the TK400 board has to be reset so that the WinConfig program can detect start of Ethernet booter program.
- Transfer via remote via Ethernet connection using COM-Server on remote PC and Ethernet booter application programs for TK400 by *Remote transfer from PC button*. The Program automatically chooses free IP address within the given subnet for connection with the Ethernet booter. Board reset is performed automatically in this case so this way of data transfer is intended for remote usage. IP settings for TCP connection with Ethernet booter are used only for the current TCP session. This method is not available for the DNP protocol. Detection of available boards has to be performed before the remote transfer function can be activated.
- Transfer remotely from PC via Ethernet using HTTPS protocol for telecontrol board types TK8xx by *Remote transfer from PC button*. The User has to enter login and password for access to HTTPS server (typically Admin/teledata). Program automatically chooses free IP address within the given subnet for connection with the telecontrol board. IP settings for TCP connection with telecontrol board are used only for the current TCP session. Detection of available boards has to be performed before the remote transfer function can be activated.

Progress bar, operation step and status information are displayed on screen in all cases of data transfer.

### Transfer from telecontrol board to PC

Transfer to PC (reading of settings from telecontrol board) can be performed in similar ways to transfer from PC:

- Transfer manually via serial line of a.eberle device for board types TK517, TK509 and TK400
- Transfer manually and locally via Ethernet for TK400 board type
- Transfer remotely via Ethernet using *COM-Server* and *Ethernet booter* application programs for TK400

- Transfer remotely via Ethernet using HTTPS protocol for TK8xx board types.

User actions for transfer to PC are similar to those for transfer from PC.

Important note:

When settings are transferred from PC to telecontrol board, they are always transferred together with appropriate application (protocol converter, firmware), with online WinConfig (web pages etc.) for REG-PE(D) boards and also together with RAMdisk and kernel for REG-PE(D) boards (can be selected as option).

Thus the remote detection (Detect on LAN) performed by WinConfig after successful transfer of data shows version of application (protocol, firmware) and also version of WinConfig that was also transferred to telecontrol board. The settings file has no version.

### 9.2.5 Remarks to all Ethernet data transfers

Detection of available telecontrol board is done by UDP broadcast telegrams.

Remote data transfers are done via TCP session open after successful detection.

WinConfig always changes IP settings of connected telecontrol board before the required data transfer is performed. The change of IP settings is temporary and is valid only during the time of data transfer.

### 9.2.6 TK400 telecontrol board:

Detection of board is performed by COM-Server program (CS or CSO) that has to be enabled and running in board memory. Remote operations without running CS cannot be performed while manual Ethernet transfer is still available.

Ethernet operations are not available for DNP3 protocol.

Data transfer from/to board is done via Ethernet booter program NBOOT that runs after card reset. Temporary change of IP settings applies also to NBOOT.

### 9.2.7 TK8xx telecontrol board:

Temporary change of IP settings applies to one or two (TK885) board interfaces according to the IP configuration of board and connected PC. Original board IP settings are automatically renewed after successful data transfer or after approximately 5 minutes timeout in the case of connection breakage during transfer.

Ethernet protocol running on board (IEC104) is interrupted during transfers.

Data transfers from/to TK8xx boards are done via secured HTTPS protocol.


**Survey of cases when Ethernet data transfers cannot be performed:**

- Telecontrol board is connected via LAN with router or firewall, which prevents telegrams used by WinConfig from passing through.
- PC with running WinConfig has two or more Ethernet interfaces connected to the same subnet.



- There is no free IP address in the connected subnet to be used for re-addressing of telecontrol board Ethernet interface.
- Ethernet interface of PC with running WinConfig has the same IP address as connected telecontrol board Ethernet interface.

### 9.2.8 Transfer settings from PC function

To transfer selected settings please click the  icon that can be found in the main menu. The following Data transfer form now appears on the right side of the settings tree.

Transfer settings from PC

Transfer settings and firmware from PC to telecontrol board

Line type: Ethernet

Transfer mode

Manual transfer: ☐

Remote transfer: ☒

Operation

Progress: 0%

Status:

Activity:

Detect on LAN

Remote transfer from PC

Figure 7: Remote transfer from PC, REG-P

Available controls:

- *Line type* – selection of way of data transfer (Ethernet or serial via a.eberle device)
- *Transfer Mode: Manual transfer or Remote transfer* – selection of the way of data transfer
- *Detect on LAN* – function of automatic detection of telecontrol boards with CSO or COM-SERVER firmware connected to LAN. List of detected boards can be seen in the above placed table after successful detection.
- *Remote transfer from PC* – execution button for activating remote transfer function.

Transfer settings from PC

Transfer settings and firmware from PC to telecontrol board

Line type: Serial via Eberle device

Serial port number: 1

Operation

Progress: 0%

Status:

Activity:

Put the device in loader mode according to the manual, press reset button of telecontrol board, wait until serial booter runs and click the 'Manual transfer from PC' button. Wait cca 30s after restart for TK400 REG-P type.

Manual transfer from PC

*Figure 8: Manual transfer from PC*

If manual transfer function is selected, user has to prepare a.eberle device rack for data transfer manually.

**Ethernet transfer** – click the *Manual transfer from PC* button **first** and **then** reset the telecontrol board. WinConfig waits until Ethernet booter runs, changes temporarily its topical IP settings, establishes TCP connection and performs required data transfer. All actions are performed automatically.

**Serial transfers** – put the a.eberle device in loader mode, reset telecontrol board and wait until the serial booter runs. Then click the *Manual transfer from PC* button.

**Comment:**

Serial null modem cable with modem signals (RTS/CTS) has to be used to enable hardware handshaking during data transfer.

### 9.2.9 Transfer settings from PC function for telecontrol boards type REG-PE(D)

HTTPS data transfer is used for transfer of settings, optionally with or without firmware (Linux Kernel and TK8xx RAM disk) in the case of TK8xx telecontrol board type. Correct REG-PED version has to be selected using radio buttons in the case when the telecontrol board firmware (Linux Kernel and TK8xx RAM disk) is also transferred. Login information has to be entered to transfer data successfully.

### Transfer settings from PC

Transfer settings and firmware from PC to telecontrol board

Automatic firmware transfer: ☒

Forced firmware transfer: ☐

Please choose your application case

☒ Usage of max. 3 COM ports

☐ Usage of max. 4 COM ports (forbidden in case of double optic Ethernet)

HTTPS access

User name:

Password:

Transmission protocol

Transmission protocol is set to HTTP

HTTPS protocol is recommended for improved security of data transfers.

Available board services

Enable www pages: ☒      Unlock UBoot: ☒

Enable SSH/SFTP: ☒      Unlock Console: ☒

For more information about board services see tooltips.

Card type	Firmware type, version	Version of settings, date	Name of settings	Device IP address	MAC address	PRP active
REG-PED (TK885)	DNP3, 1.44.1	11.0.6, 20140130	DNP3_REGD_BASIC	10.1.10.197, 172.168.56.137	00D09322DF32, 00D09322DF33	no

Operation

Progress:  100%

Status: Finished

Activity: Completed detecting devices

Steps to transfer settings

1. Detect board on LAN
2. Select board in the table
3. **Transfer from PC to device**

Figure 9: Transfer from PC for telecontrol boards type REG-PE(D)

#### TK8xx special controls:


- *Automatic firmware transfer/Forced firmware transfer* radio button – selection whether WinConfig is supposed to decide about necessity to transfer also kernel, RAM disk or both (*Automatic firmware transfer*) or whether kernel and RAM disk will be transferred in any case (*Forced firmware transfer*).
- *Selection of application case* – selection of the correct version of the REG-PED board concerning usage of COM ports. This selection affects the version of telecontrol board firmware.
- *User name* – user login for HTTPS access
- *Password* – user password for HTTPS access
- *Use last login values* – used last remembered login values
- *Forget login values* – don't remember the entered login values
- *Transmission protocol*:
  - *Set HTTPS - use HTTPS protocol for data transfers to ensure security of transferred data,*
  - *Set HTTP - use standard unsecured HTTP protocol.*
- *Available board services: Enable WWW pages, Enable SSH/SFTP, Unlock UBoot, Unlock Console* – options are dedicated to advanced user and allow to modify behaviour of telecontrol board to achieve security of data transfers by enabling/disabling the corresponding services or by performing the indicated actions.
- *Change board IP settings* – this button switches to the *REG-PE(D) board IP settings* page.
- *Run RPL* – this button runs the *REG-PEX loader* configuration software that can be used to configure a REG-PE(D) board in the case when the firmware on board is insufficient for the detection by WinConfig. The usage of RPL requires serial connection between the PC and board being configured.
- *Submit certificates* – this button switches to the *Submit certificates* page.
- *Available board services* – check buttons to enable/disable board services
  - *Enable www pages* – this option enables/disables online WinConfig installed in the board. If www pages are disabled, user can manage the board by menu system.
  - *Enable SSH/SFTP* – this option enables the online console (access to board via menu system).

#### Transfer steps:

WinConfig uses special algorithm for transfer of software necessary to run the application program and settings. The sequence of individual steps can be automatically modified according to the software version and actions needed for complete update of software stored in the board.

Step	Explanation
Preparation of up-grade mode	Detection of kernel and ramdisk version, switching the tele-control board to upgrade mode
Creating backup	Creation of backup of application and settings, applicable only in the case when kernel will be updated
Waiting for backup creation	Applicable only in the case when kernel will be updated
Transfer of backup to PC	Applicable only in the case when kernel will be updated
Transfer of kernel and/or ramdisk from PC	Applicable only in the case when kernel and/or ramdisk is updated
Waiting for kernel and/or ramdisk transfer	Applicable only in the case when kernel and/or ramdisk is updated
Transfer of backup from PC	Applicable only in the case when kernel was updated
Firmware transfer from PC	Transfer of application program and settings

### 9.2.10 Transfer settings to PC function

To transfer settings from telecontrol board to PC settings click the  icon in the main menu. Transfer form appears in the right side of the settings tree.

### Transfer settings to PC

Transfer settings from telecontrol board to PC

Board type: REG-PE(D)

Line type: Ethernet

HTTPS access

User name: Admin

Password: .....

Use last login values    Forget login values

Transmission protocol

Transmission protocol is set to HTTPS

Set HTTPS    Set HTTP

HTTPS protocol is recommended for improved security of data transfers.

Card type	Firmware type, version	Version of settings, date	Name of settings	Device IP address	MAC address	PRP active
REG-PE (TK860)	DNP3,	10.5.5, 20140130	DNP3_REGD_BASIC	10.1.10.195	00D09306ABD2	---
REG-PED (TK885)	DNP3, 1.42.2	11.0.1, 20140130	DNP3_REGD_BASIC	10.1.10.196	00D09322DF32	no

Operation

Progress: 100%

Status: Finished

Activity: Completed detecting devices

Detect on LAN

Remote transfer to PC

Compare with selected settings

Change board IP settings

Submit certificates

Steps to transfer settings

1. Detect board on LAN
2. Select board in the table
3. Remote transfer to PC

Figure 10: Transfer settings to PC

All user actions are similar as those for *Transfer settings from PC* function.

The *Compare with selected settings* button runs the function for comparison of the settings currently selected in WinConfig and settings in the telecontrol board. The results of comparison are presented in the Microsoft Excel workbook.

### 9.2.11 Change of IP settings for REG-PE(D) telecontrol boards

To change IP settings for telecontrol board type TK8xx, click the *Change board IP settings* button that appears on the screen when successful detection of a TK8xx board on LAN is performed and the particular board selected. The detection can be done before the data transfer either from or to PC. The IP settings of the REG-PE(D) telecontrol board are protocol-independent. The following window appears on screen:

REG-PE(D) board IP settings

[Set IP settings to telecontrol board](#)

Board type:REG-PED (TK885)

Board name:TK885

Use PRP V1 (Parallel Redundancy Protocol):☐

Use Ethernet interfaces bonding (Broadcast):☒

Use Ethernet interfaces independently:☐

Ethernet interface

MAC:00D09322DF32

IP address:10.1.10.196

Subnet mask:255.255.255.0

Gateway IP address:10.1.10.1☒ Gateway used

Operation

Progress:0%

Status:

Activity:

Set

Go to "Transfer to PC" page




Figure 11: REG-PE(D) board IP settings



Enter new values and click the Set button to change IP settings of Ethernet interfaces.

If you want to prevent Ethernet interface fail, click the *Use Ethernet interfaces bonding* option box to bond Ethernet interfaces and to use 'Active backup' policy.

The 2<sup>nd</sup> Ethernet interface is available only for REG-PED (TK885) board type. One of the defined gateways can be selected as default gateway by the radio button *Gateway used*.

To switch off the bonding of Ethernet interfaces check the *Use Ethernet interfaces independently* checkbox.

To use PRP V1(Parallel Redundancy Protocol) check the *Use PRP* checkbox.

### 9.2.12 Submit certificates for REG-PE(D) telecontrol boards

Security certificates are used for HTTPS communication with REG-PE(D) telecontrol board. Telecontrol boards are supplied with default factory certificates that can be rewritten by user certificates. The certificates are used by board as its own authentication information.

The user certificate can be obtained from the Certification Authority (CA) or generated by a special program (e.g. OpenSSL). The certificates have to be in the PEM (Privacy Enhanced Mail) format; other formats can be converted to PEM using appropriate program.

The certificate typically consists of *certificate file* and *key file*. If the certificate is issued by CA then there is also *CA certificate file* and possibly also *intermediate certification file* in the case when Intermediate certification authority is used by CA. The *key file* must not be password protected to be accepted by REG-PE(D).

In the case when a special program is used for generation of certificate, it is possible to generate CA or to use CA that is already available (3 created files) or to generate self-signed certificate (2 created files).

For more information about certificates please consult the publicly available information in the Internet.

All necessary actions for rewriting the default certificates can be done on *Certificates* page.

To submit user certificates browse the certificate files and transfer them to the telecontrol board by *Submit* button.

Certificates

Transfer of files

All certificate and key files are expected in PEM format.

CA certificate file:

Browse...

Intermediate certificate file:

Browse...

Certificate file:

Browse...

Key file:

Browse...

HTTPS access

User name:

Password:

Operation

Progress:

0%

Status:

Activity:

Submit

Go to "Transfer from PC" page




Figure 12: REG-PE(D) board certificates



### 9.2.13 Bonding

The Ethernet interface bonding is a software feature to achieve higher security. If the feature is activated then Ethernet interfaces have the same MAC and IP addresses. This leads to redundancy in the case of broken Ethernet cable.

When the bonding option is switched ON, the firmware uses the Ethernet interface via which the connection was established and in the case of connection breakage (link is down because of broken or disconnected Ethernet cable) the firmware automatically switches to the second bonded interface that works as backup.

The Use Ethernet interface bonding option and dual Ethernet ports are available only for TK885 board type, the TK860 and TK885-1 card types have only one Ethernet interface available.

Furthermore, there are more conditions in connection with the bonding option:

- The TK885 board with 2x fibre optic COM ports has always COM 4 port disabled and bonding available.
- Other versions of TK885 board use two different firmwares (Linux Kernels) according to the bonding function. The checkbox Use Ethernet interfaces bonding in the REG-PE(D) board *IP settings* page of WinConfig is enabled/disabled according to the Kernel version of the REG-PED board detected and selected in the previous *Transfer settings from PC* page.
- If the bonding is required but not supported by the current Kernel loaded in the board, go to the *Transfer settings from PC* page and transfer the settings together with the firmware and correct version of REG-PED board.
- If the bonding option is available in firmware then the COM 4 port cannot be used.

When using the bonding feature, always keep in mind that the correct version of firmware with bonding option has to be selected for boards with electric or electric/fiber optics Ethernet interfaces and the bonding option has to be switched ON in the REG-PED board IP settings page. Also keep in mind that the COM4 serial port cannot be used in the case of firmware with bonding option.

### 9.2.14 PRP - Parallel Redundancy Protocol

A network redundancy is to have two independent active paths between two devices. The sender (TK885) uses two independent network interfaces that transmit the same data simultaneously. The redundancy monitoring protocol then makes sure that the recipient uses only the first data packet and discards the second. If only one packet is received, the recipient knows that a failure has occurred on the other path. The parallel redundancy protocol is described in the IEC 62439-3 standard.

### 9.3 Compare settings function

Two compare modes can be found on the WinConfig Compare settings page. Select the desired mode in the Compare mode frame.

#### Compare selected settings with settings file

To compare a pair of settings browse two xml setting files to compare, and then click the Compare button.

#### Compare two settings files

To compare a currently selected settings with an xml setting file browse this file and click the *Compare* button.

Results of the comparisons are available in a Microsoft Excel xls file that is created from this comparison. Individual sets of settings are arranged in individual sheets in Excel workbook. Differences can be seen colored in the Excel sheets. Black fonts are used for matching pairs of settings, magenta fonts for different pairs and red fonts for missing settings.

The screenshot shows the 'Compare settings' window. At the top is a title bar with the text 'Compare settings'. Below it is a section titled 'Compare mode' with two radio buttons: 'Compare selected settings with settings file:' (which is selected) and 'Compare two settings file:'. Below this are two sections for file selection. The first is 'First settings file' with a text input field and a 'Browse...' button. The second is 'Second settings file' with a text input field and a 'Browse...' button. Below these is an 'Operation' section containing a progress bar labeled 'Progress: 0%', and labels for 'Status:' and 'Activity:'. At the bottom of the window is a 'Compare' button.

*Figure 13: Compare settings*

The third compare mode implemented in WinConfig is comparison of the selected settings with settings contained in the connected telecontrol board. This function is available in the Transfer settings to PC page as Compare to selected settings button. It is necessary to detect the board first in the case of remote mode. The rules of comparison are same as described above. This functionality cannot be used with TK509 telecontrol boards where Transfer settings to PC functionality are not available.

## 9.4 Rules for export/import using Microsoft Excel

### 9.4.1 Export to Excel

**Ways of export:**

- Commands only of selected device from *Commands* page
- Indications only of selected device from *Indications* page
- Entire selected settings using *Export* icon in the main menu.

Data is exported into the new file winconfig-exportxx.xls placed in the system temp folder.

Individual parts of exported data are placed in individual sheets of Excel workbook, i.e. commands of each device and indications of each device are placed in corresponding sheets, e.g. sheet of indications of device A: is named x. *device A indications* and commands sheet is named x. *device A commands* (where x is the device order number). The character “:” in device name is skipped as Excel doesn’t allow usage of this character in the sheet name.

Data is arranged in lines. First line represents heading with settings names according to the corresponding XML template.

The exported sheets also contain plain text describing setting names. This information can be found in the second row of the table-based sheets and in second columns of the other sheets.

### 9.4.2 Import from Excel

**Ways of import:**

- Commands from selected sheet to *Commands* page of selected device.
- Indications from selected sheet to *Indications* page of selected device.

Import is performed from the Excel file with valid .xls extension. The file has to contain corresponding sheet with appropriate name and heading line with names of settings according to the corresponding XML template (see Export). Import function uses topical settings as target and replaces existing data in the target settings.

Import settings

Finish

Device	Import	Identifier of the device
1	<input type="radio"/>	A:
2	<input type="radio"/>	A:
3	<input checked="" type="radio"/>	A:
4	<input type="radio"/>	E1:
5	<input type="radio"/>	E2:

Figure 14: Import settings

## 9.5 Migration of settings

WinConfig can migrate settings between different versions of REG-P telecontrol boards. The migration can be done in two ways:

- Convert GenReg INI file with REG-P board type selected in the *Open settings* page (other than the telecontrol board for which INI file was originally created, e.g. INI file created for TK517 and IEC101 protocol can be open as IEC101 for TK400 telecontrol board).
- Using Migrate button on *Basic settings* page. In this way the migration between TK400 and TK517 boards in both directions can be performed.

First step of migration and INI file conversion implemented in WinConfig is to check for completion and correctness of settings data. This has to be done due to some hardware differences that exist between some REG-P boards.

The *Missing/incorrect values* page provides user interaction possibility during the check process and default values are suggested for changing and confirmation.

**Missing/incorrect values**

Setting name: old value new value

IEC101

Reject commands with unknown address: not found ☒

Use originator (0): not found ☐

Time synchronization settings

Synchronize devices by REG-P: not found ☒

Synchronize all devices connected to ELAN: not found ☒

Continue

Figure 15: Missing/incorrect values

## 9.6 Checking of entered values

Standard WinConfig pages containing textboxes, checkboxes, selections etc. perform online initial internal checking of values entered in each textbox. The check runs when user leaves the textbox. Entered values are checked for valid limits. If limits are broken, the last or default value is automatically entered and text box is marked by red color. Correctly entered values are also marked – their label color is changed to red. User cannot leave the page without confirmation or resetting of the changed values.

WinConfig pages containing tables (values are organized in tabular format, e.g. indications, commands) also contain online internal checking of individual cells. The check runs when the user leaves cell. Entered values are checked on valid limits. If limits are broken, the last or default value is automatically entered and cell is marked by red color. Correctly changed values are not marked. User cannot leave the page without confirmation or resetting of the changed values.

There is also additional integrity test of values present within the confirmation procedure. This test checks three basic rules:

- Test of non-zero values of object addresses,
- Existence of non-empty command strings in command tables,
- Test of uniqueness of object address, which is performed entirely for all addressable objects in the settings, i.e. comparison of each address with other addresses. Uniqueness of devices text IDs is not tested. There are some exceptions from the rule e.g. in IEC103/TK8xx where TK3 type data points are tested on uniqueness together with measurement value type.

## 10. IEC101 settings

### 10.1 Basic

Basic settings tree branch form contains common settings of IEC protocol – selection of available Baud rates, Link and ASDU addresses shown as one number or pair of Bytes. Basic settings also contain user definable descriptions - and names for the entire set of settings.

Basic

Settings description: IEC101\_REG-D\_BASIC

Baud rate of serial port IEC [Bd]: 9800

Link address of REG-P: 1 ( Link hi: 0 Link lo: 1 )

ASDU address: 1 ( ASDU hi: 0 ASDU lo: 1 )

IEC RS485 activated: ☐

IEC fiber optics activated: ☐

IEC RS232 used: ☒

Idle mode of fiber optics is switched by accordant setting.

Device	Identifier of device
1	AA:

Confirm

Reset

Migrate to TK517

Figure 16: IEC101 basic settings

Table 2: IEC101 basic settings

Setting	Format	Range	Default	Description
Settings de- scription	text	50 charac- ters	Filename of open settings	Short user description of settings file or name of settings file.
Baud rate of serial port IEC	Bd	Selection of values in combo box	9600	Baud rate of IEC101 serial port
Link address of REG-P	-	0 to 255 or 0 to 65535	1	Link address displayed as word or set of two bytes. The range is determined by the Link address size option in advanced settings.
ASDU address	-	0 to 255 or 0 to 65535	1	ASDU address displayed as word or set of two bytes. The range is determined by the ASDU address size option found in advanced settings.
IEC RS485 acti- vated	-	option box	NOT selected	Activation of RS485 interface option. This option is greyed out and not functional in the case for REG-P telecontrol boards with jumpers.
IEC fiber optics activated	-	option box	NOT selected	Activation of fiber optics interface option. This option is greyed out and not functional in the case for REG-P telecontrol boards with jumpers.
IEC RS232 used	-	option box	selected	Activation of RS232 interface option. This option is grayed out and not functional in the case for REG-P telecontrol boards with jumpers.
Identifier of device	text	3 characters	defaults de- fined in the Devices tree branch	Device identifier string for device protocol



## 10.2 Advanced

### 10.2.1 IEC101 Settings - SCADA for REG-P telecontrol boards

The Settings - SCADA tree branch contains several board specific settings available for TK400 and TK517 telecontrol board types without jumpers and also contains a full range of IEC101 specific settings.

IEC101

Interface settings

IEC receiver inverted:

☐

IEC transmitter inverted:

☐

IEC RTS signal inverted:

☐

IEC CTS signal inverted:

☐

IEC RS485 activated:

☐

IEC fiber optics activated:

☐

IEC RS232 used:

☒

Baud rate of serial port IEC [Bd]:

9600

ON time of serial LEDs [10ms]:

1

RTS/CTS

Activate serial RTS/CTS:

☐

Don't activate serial RTS/CTS:

☒

Protocol settings

Link address of REG-P:

1

( Link hi: 

0

 Link lo: 

1

 )

ASDU address:

1

( ASDU hi: 

0

 ASDU lo: 

1

 )

Link address size:

1

ASDU address size:

2

Info address size:

3

Use single byte response:

☐

Don't use single byte response:

☒

Use originator (0):

☐

Max. objects in telegram:

20

Inter character timeout [ms]:

4

Timeout after interchar [ms]:

10

Time after TI105 conf. [10ms]:

100

IEC address of error multipoint:

0

( hi: 

0

 mi: 

0

 lo: 

0

 )

Errors data type:

TI1

Reject commands with unknown address:

☐

Balanced specific

Use balanced mode:

☐

Use unbalanced mode:

☒

Confirm

Reset

Figure 17: Settings – SCADA, IEC101 REG-P

Table 3: Settings – SCADA, IEC101 REG-P

Setting	Format	Range	Default	Description
IEC receiver inverted	-	option box	NOT selected	Inversion of RxD signal
IEC transmitter inverted	-	option box	NOT selected	Inversion of TxD signal
IEC RTS signal inverted	-	option box	NOT selected	Inversion of RTS signal
IEC CTS signal inverted	-	option box	NOT selected	Inversion of CTS signal
IEC RS485 terminator activated	-	option box	NOT selected	Activation of RS485 bus terminator.
IEC RS485 activated	-	option box	NOT selected	Activation of RS485 interface option. This option is not functional in the case for REG-P telecontrol boards with jumpers.
IEC fiber optics activated	-	option box	NOT selected	Activation of fiber optics interface option. This option is not functional in the case for REG-P telecontrol boards with jumpers.
IEC RS232 used	-	option box	selected	Activation of RS232 interface option. This option is not functional in the case for REG-P telecontrol boards with jumpers.
Baud rate of IEC serial	Bd	Selection of values in combo box	9600	Baud rate of IEC101 serial port;
ON time of serial LEDs	10 ms	1 to 100	1	ON time of serial LEDs indicating activity on the IEC serial interface
Link address of REG-P	-	0 to 255 or 0 to 65535	1	Link address displayed as word or set of two bytes. The range is determined by the Link address size option.
ASDU address	-	0 to 255 or 0 to 65535	1	ASDU address displayed as word or set of two bytes. The range is determined by the ASDU address size option.
Link address size	-	Selection of values in combo box	1	Size of link address in Bytes
ASDU address size	-	Selection of values in combo box	2	Size of ASDU address in Bytes
Info address size	-	Selection of values in combo box	3	Size of information address (IOA) in Bytes
Use/Don't use single byte response	-	option box	Use	Usage of short single-byte responses.

Setting	Format	Range	Default	Description
Use single byte response for ACK/Use single byte response for NAK	-	option box	ACK	Single-byte response used for ACK/NAK
Single byte response	HEX	0 to FF	E5	Value of single byte response
Use originator (0)	-	option box	NOT selected	Usage of originator (value 0)
Max objects in telegram	-	1 to 50	20	Max. No. of data objects in telegram
Inter character timeout	ms	2 to 100	4	Timeout between two characters in telegram
Timeout after interchar	ms	0 to 255	10	Timeout after Interchar timeout expiration
Time after TK105 conf.	10 ms	0 to 65535	100	Timeout after TK105 confirmation
IEC address of error multipoint	-	0 to 16777215 or 3x 0 to 255	0	IEC address (IOA) of multipoint for errors, 0 - undefined
Errors data type	-	Selection of values in combo box	Tt1	Data type for errors in IEC101 communication

### Balanced mode settings:

Balanced specific

Use balanced mode: ☒
Use unbalanced mode: ☐

Direction bit: 0

Timeout for secondary ACK [10ms]: 20

Max repeats of primary station tlg.: 4

IAWD

Use IAWD mode: ☒
Don't use IAWD mode: ☐

AT control string:

Dial string:

Time to wait for connection [s]: 1

Number of dial repeats: 2

Dial pause [s]: 1

Time to keep connection open [s]: 1

Figure 18: Balanced mode settings

Table 4: IEC101 balanced mode settings

Setting	Format	Range	Default	Description
Use balanced mode / Use unbalanced mode	-	option box	unbalanced	Selection of IEC101 mode
Direction bit	-	selection of values in combo box	0	Direction bit
Timeout for secondary ACK	10 ms	1 to 255	20	Timeout for secondary ACK
Max repeats of primary station telegram.	-	1 to 255	4	Max. No. of repeats of primary station telegram
Use IAWD mode / Don't use IAWD mode	-	option box	Don't use	IAWD mode selection
AT control string	text	80 characters	empty	AT control string
Dial string	text	20 characters	empty	Dial string
Time to wait for connection	s	1 to 60	1	Time to wait for connection
Number of dial repeats	-	1 to 255	2	Number of dial repeats
Dial pause	s	1 to 60	1	Dial pause
Time to keep connection open	s	1 to 60	1	Time to keep connection open

10.2.2 IEC101 Settings - SCADA for REG-PE(D) telecontrol boards

IEC101 *Settings* – SCADA for REG-PE(D) boards contain IEC101 specific parameters for corresponding firmware in REG-PE(D) (TK860, TK885) telecontrol boards.

IEC101

Interface settings

Serial port:

COM1

Baud rate of serial port IEC [Bd]:

19200

Parity:

EVEN

ON time of serial LEDs [ms]:

10

RS485 activated:

☐

RTS/CTS:

☐

XON/XOFF:

☐

Connecting fiber optic module ("FTR") is possible but idle mode must be set via jumper in module.

Protocol settings

Link address of REG-PE(D):

1

( Link hi: 0 Link lo: 1 )

ASDU address:

1

( ASDU hi: 0 ASDU lo: 1 )

Link address size:

1

ASDU address size:

2

Info address size:

3

Use originator (0):

☐

Max. length of telegram:

200

Link status timeout[ms]:

3000

First char timeout [ms]:

300

Max. timeout between master requests [s]:

1000

Activate termination after command:

☒

Max. waiting time for ACK/NACK [s]:

6

Max. waiting time for command after select [s]:

5

Mode of watchdog LED:

blinking

Confirm

Reset

Figure 19: Settings – SCADA, IEC101 REG-PE(D)

IEC101 settings

Page 53

Table 5: IEC101 REG-PE(D) Settings – SCADA, interface settings

Setting	Format	Range	Default	Description
Serial port	-	-	COM1	Selection of serial port. This option is disabled, selection is done in the <i>Serial port assignment</i> branch
Baud rate of serial port IEC	Bd	Selection of values in combo box	19200	Baud rate of serial port
Parity	-	Selection of values in combo box	EVEN	Serial port parity
ON time of serial LEDs	ms	1 to 100	10	ON time of serial LEDs
RS485 activated	-	checkbox	unchecked	Activation of RS485
RTS/CTS	-	checkbox	unchecked	Activation of RTS/CTS handshaking
XON/XOFF	-	checkbox	unchecked	Activation of XON/XOFF handshaking

Table 6: IEC101 REG-PE(D) Settings – SCADA, protocol settings

Setting	Format	Range	Default	Description
Link address of REG-PE(D)	-	1 to 254 1 to 65534	1	Link address of REG-PE(D), range is dependent on Link address size
ASDU address	-	1 to 254 1 to 65534	1	ASDU address of REG-PE(D), range is dependent on ASDU address size
Link address size	Byte	Selection of values in combo box	1	Link address size
ASDU address size	Byte	Selection of values in combo box	2	ASDU address size
Info address size	Byte	Selection of values in combo box	3	Info address size:
Use originator (0)	-	checkbox	unchecked	Usage of originator
Max. length of telegram	Byte	1 to 255	200	Maximum length of telegram
Link status timeout	ms	2 to 1000		Link status timeout
First char timeout	ms	0 to 65535	300	First char timeout
Max. timeout between master requests	s	0 to 255		Max. timeout between master requests
Activate termination after command	-	checkbox	unchecked	Activate termination after command

Max. waiting time for ACK/NACK	s	0 to 255	6	Maximum waiting time for ACK/NACK
Max. waiting time for command after select	s	0 to 255	5	Maximum waiting time for command after select
Mode of watchdog LED	-	Selection of values in combo box	blinking	Mode of watchdog LED

### 10.2.3 ComServer settings

ComServer settings form part of the IEC settings in WinConfig for TK400 and TK8xx. ComServer is included in the protocol conversion firmware in the case of serial protocols with the exception of DNP for the purpose of remote management of telecontrol board configuration.

### ComServer settings

**ComServer**

Use ComServer function: ☒

Don't use ComServer function: ☐

Local (REG-P) IP address:

Gateway IP address:

Subnet mask:

Accept any valid client IP: ☐

Remote (client) IP address:

TCP port (data transfer):

ON time of TCP LEDs [10ms]:

Figure 20: TK400 ComServer settings

Table 7: TK400 COM-Server settings

Setting	Format	Range	Default	Description
Use ComServer function / Don't use ComServer function	-	option box	Don't use	Selection of COM-Server function
Local IP address	-	4x 0 to 255	0.0.0.0	COM-Server IP address
Accept any valid client IP	-	option box	selected	Selection whether COM-Server should accept any valid IP for connection
Remote IP address	-	4x 0 to 255	0.0.0.0	Accepted IP address for connection
Gateway IP address	-	4x 0 to 255	0.0.0.0	IP address of default gateway.
Subnet mask	-	4x 0 to 255	0.0.0.0	Subnet mask
TCP port	-	0 to 65535	1023	COM-Server TCP port. Changing of these settings is not recommended.

Setting	Format	Range	Default	Description
ON time of TCP LEDs	ms	1 to 60	2	ON time of TCP LEDs



COM-Server for REG-P (TK400) telecontrol board is necessary for all remote operations in WinConfig, i.e. all remote data transfers, detections on LAN, remote comparison of settings with connected board etc. If COM-Server is switched off, only local (manual) operations of WinConfig can be used.

10.2.4 ComServer settings, IEC101 for REG-PE(D)

For parameters of ComServer function in IEC101 for REG-PE(D) see the *IEC103 for REG-PE(D)* chapter in this manual.

10.2.5 Supervisory settings, IEC101 for REG-PE(D)

For parameters of Supervisory settings in IEC101 for REG-PE(D) see the *IEC103 for REG-PE(D)* chapter in this manual.

10.3 Linked devices

The *Linked Devices* tree branch shows survey of all 8 devices that can be used in settings created by WinConfig. Only the devices checked as *Enabled* are described in the following tree branches. To add new device to the topical settings check the corresponding *Enabled* option box. Identifier of the enabled device can be consequently changed in the corresponding *Device x* tree branch.

Devices

Device	Enabled	Identifier of the device	Poll type
1	<input checked="" type="checkbox"/>	A:	RPS
2	<input type="checkbox"/>	B:	RPS
3	<input type="checkbox"/>	C:	RPS
4	<input type="checkbox"/>	D:	RPS
5	<input type="checkbox"/>	E:	RPS
6	<input type="checkbox"/>	F:	RPS
7	<input type="checkbox"/>	G:	RPS
8	<input type="checkbox"/>	H:	RPS

Confirm

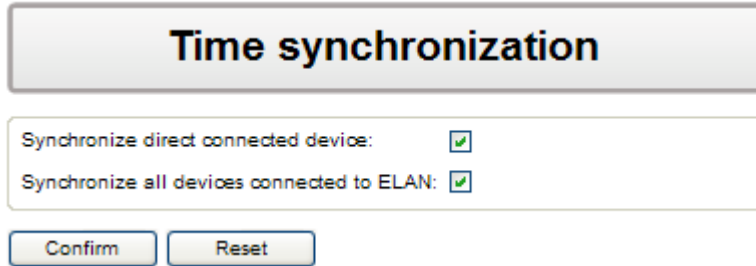
Reset

Figure 21: Linked Devices



### 10.3.1 Time synchronization

Settings tree branch for time synchronization settings.



The image shows a software dialog box titled "Time synchronization". It contains two checked checkboxes: "Synchronize direct connected device:" and "Synchronize all devices connected to ELAN:". At the bottom, there are two buttons labeled "Confirm" and "Reset".

*Figure 22: Time synchronization settings*

For parameters of Time synchronization in IEC101 for REG-PE(D) see the *IEC103 for REG-PE(D)* chapter in this manual.

### 10.3.2 Internal communication

The *Internal Communication settings* tree branch describes settings of communication settings for communication between telecontrol board and a.eberle device.

**Internal communication**

Baud rate of device serial port [Bd]:	115200 ▾
ON time of serial LEDs [10ms]:	1
Timeout for reception of first char [10ms]:	50
Inter character timeout [10ms]:	20
Number of repeats for SYNC cycle:	5
Number of command repeats:	2
TX blocking [ms]:	30
Timeout for analogs cyclic sending [100ms]:	0
Time to stop device interrogation [s]:	0
Round time down:	<input checked="" type="radio"/>
Round time up:	<input type="radio"/>

Confirm

Reset

Figure 23: Internal communication, IEC101 for REG-P

Table 8: Internal communication

Setting	Format	Range	Default	Description
Baud rate of device serial	Bd	selection of values in combo box	115200	Baud rate of serial communication with device
ON time of serial LEDs	10 ms	1 to 100	1	ON time of serial LEDs
Timeout for reception of first char	10 ms	1 to 255	50	Timeout for reception of first character
Inter character timeout	10 ms	1 to 255	20	Timeout between two characters in telegram
Number of repeats for SYNC cycle	-	1 to 255	5	Number of repeats for SYNC cycle
Number of command repeats	-	1 to 255	2	Number of command (poll) repeats
TX blocking	ms	0 to 255	30	Time to wait when answer was received
Timeout for analog cyclic sending	100 ms	0 to 650	0	Timeout for analog (measurements) cyclic sending (0 = disable)
Time to stop REG-D/A. interrogation	s	0 to 650	0	Time to stop regulator interrogation after IEC communication break
Round time down / Round time up	-	Option box	Round down	Rounding time selection

For parameters of Internal communication in IEC101 for REG-PE(D) see the *IEC103 for REG-PE(D)* chapter in this manual.

### 10.3.3 Converter Errors

The *Converter Errors* table describes settings of error indications generated by telecontrol board. Meaning of individual error bits is described in the table. Multipoint bit comprises all defined bits in the table. Data type of errors in the IEC protocol is defined in IEC101 settings, see chapter 4.2.2.

Converter errors

Confirm

Reset

ID	Comment	Information object address (IOA)	IOA (hi/ni/lo)
0	Device 1 communication error	8208	0 / 32 / 16
1	Device 2 communication error	0	0 / 0 / 0
2	Device 3 communication error	0	0 / 0 / 0
3	Device 4 communication error	0	0 / 0 / 0
4	Device 5 communication error	0	0 / 0 / 0
5	Device 6 communication error	0	0 / 0 / 0
6	Device 7 communication error	0	0 / 0 / 0
7	Device 8 communication error	0	0 / 0 / 0
multipoint		0	0 / 0 / 0

Figure 24: Converter errors

10.4 Device x

10.4.1 Device request settings

Device request settings tree branch describes communication settings of individual devices connected to telecontrol board.

Device Request Settings

Identifier of device: AA:

Poll type: RPS

Poll string: RPS 4

RPS specific

Size of answer [byte]: 244

Offset of seconds field [byte]: 18

Offset of msec field [byte]: 22

Confirm

Reset

Figure 25: Device request settings

Table 9: IEC101 device settings

Setting	Format	Range	Default	Description
Identifier of de-vice	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device as appears in the device communication
Poll type	-	selection of values in combo box	RPS	Device poll type
Poll string	text	23 chars	RPS 4	Device poll string

Setting	Format	Range	Default	Description
RPS specific: Size of answer	byte	1 to 255	244	Size of answer
RPS specific: Offset of seconds field	byte	0 to 255	18	Offset of seconds field
RPS specific: Offset of msec field	byte	0 to 255	22	Offset of msec field

## Device Request Settings

Data class used: ☒ Yes ☐ No

Identifier of device:

Poll string:

Size of answer [byte]:

Type of seconds field:  ▼

Offset of seconds field [byte]:

Type of msec field:  ▼

Offset of msec field [byte]:

Comment:

Figure 26: IEC101 device request settings for REG-PE(D)

Table 10: IEC101 device settings for REG-PE(D)

Setting	Format	Range	Default	Description
Data class used	-	Option boxes	Yes	Usage of Data class
Identifier of device	-	3 characters	AA:	Identifier of device
Poll string	-	24 characters	RPS 4#A20f14	Poll string
Size of answer	byte	1 to 294	247	Size of answer:
Type of seconds field	-	Selection of values in combo box	INT32U	Type of seconds field
Offset of seconds field	byte	0 to 255	18	Offset of seconds field
Type of msec field	-	Selection of values in combo box	INT16U	Type of seconds field

Setting	Format	Range	Default	Description
Offset of msec field	byte	0 to 255	22	Offset of msec field
Comment	-	23 characters	REG-D	Comment

10.4.2 Indications

Indications tree branch describes indications of individual device. Rules for work with those settings are the same as for work with commands.

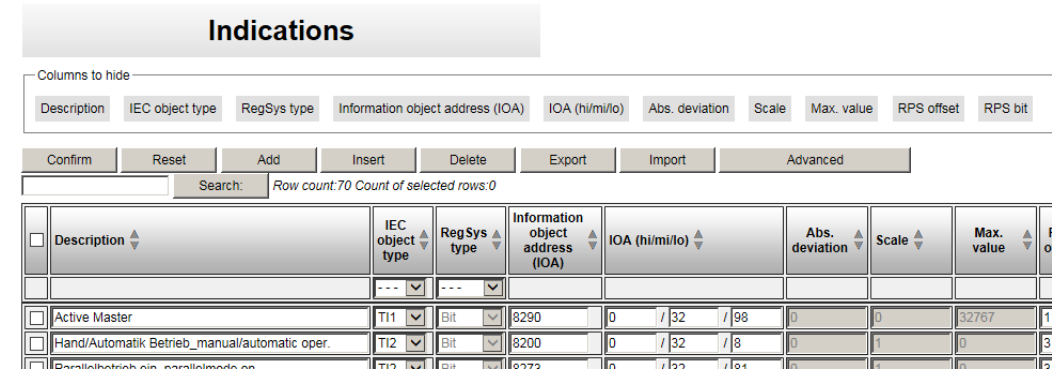


Figure 27: Indications

The RegSys type is disabled by default. To edit RegSys type use the *Advanced* button to enable corresponding column. The same rule is valid for all protocols using RegSys type as parameter of indications.

Table 11: IEC101 indications

Setting	Format	Range	Default	Description
IEC object type	-	selection of values in combo box	TI1	Indication type in IEC communication
REG data type	-	selection of values in combo box	Bit	Indication type in device communication
Information object address (IOA) (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	IEC address (IOA) of indication
Abs. deviation	float		0	Absolute deviation value
Scale	float		0	Scale value
Max. value	-	0 to 65535	32767	Max. value
RPS offset	-	0 to 255	0	RPS offset
RPS bit	-	selection of values in combo box	0	RPS bit
P1 data type (P1 method)	-	selection of values in combo box	IEEE type	P1 data type
P1 index (P1 method)	-	3 to 255	3	P1 index
Table (P1 method)	-	selection of values in combo box	0	Table No. if 32 bit data type is used

Setting	Format	Range	Default	Description
Bit (P1 method)	-	selection of values in combo box	0	Bit No. if 32 bit data type is used
Description	text	50 chars	empty	Description

Indications

Columns to hide

Description

Disabled

Information object address (IOA)

IOA (hi/mi/lo)

IEC object type

RegSys type

RPS offset

RPS bit

Dead band

Deinterrogation

Inverted

Remote COT Offset

Remote COT Bit

Send if only quality changed

Confirm

Reset

Add

Insert

Delete

Export

Import

Advanced

Search:

Row count: 245 Count of selected rows: 0

<input type="checkbox"/>	Description	Disabled	Information object address (IOA)	IOA (hi/mi/lo)	IEC object type	RegSys type	
		---			---	---	
<input type="checkbox"/>	Status:1;	No	65793	1 / 1 / 1	1	BIT8 (0..7 in BYTE)	3
<input type="checkbox"/>	Overrun:1;	No	65794	1 / 1 / 2	1	BIT8 (0..7 in BYTE)	3
<input type="checkbox"/>	Error_Parallel_Processing	No	65795	1 / 1 / 3	1	BIT8 (0..7 in BYTE)	3
<input type="checkbox"/>	Error_ELAN:1;	No	65796	1 / 1 / 4	1	BIT8 (0..7 in BYTE)	3
<input type="checkbox"/>	Error_TC_Position:1;	No	65797	1 / 1 / 5	1	BIT8 (0..7 in BYTE)	3
<input type="checkbox"/>	Manual_Auto:1;	No	65798	1 / 1 / 6	2	BIT8 (0..7 in BYTE)	3
<input type="checkbox"/>	Single_Parallel:1;	No	65799	1 / 1 / 7	2	BIT8 (0..7 in BYTE)	3

Figure 28: IEC101 Indications for REG-PE(D)

Table 12: IEC101 indications

Setting	Format	Range	Default	Description
Description	text	50 chars	empty	Description
Disabled	-	selection of values in combo box	No	Option to disable the data point
Information object address (IOA) (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	IEC address (IOA) of indication
IEC object type	-	selection of values in combo box	TI1	Indication type in IEC communication
RegSys type	-	selection of values in combo box	Bit8	Indication type in device communication
RPS offset	-	0 to 65535	0	RPS offset
RPS bit	-	0 to 31	0	RPS bit
Dead band	-	float	0	Dead band
Dead band absolute number	-	selection of values in combo box	No	Selection of Dead band format: absolute number or value in percent
Max. range	-	float	0	Maximum range
Resolution	-	float	0	Resolution
Initial value transmission	-	selection of values in combo box	No	Initial value transmission
Use in GI	-	selection of values in combo box	Yes	Use in GI
Group interrogation	-	0 to 16	0	Group number for group interrogation
Inverted	-	selection of values in combo box	No	Inverted
Offset connected with remote COT	-	0 to 512	0	Offset connected with remote COT
Remote COT bits of remote offset	-	0 to 7	0	Remote COT bits of remote offset
Send group change	-	selection of values in combo box	No	Send group change



10.4.3 Commands

Table of settings of individual commands represents command settings. This table is common for all a.eberle devices connected to the telecontrol board.

The upper line contains execution buttons for work with the individual command lines and for export/import of the entire table of commands.

Selected line in the table is marked by yellow background. All changes have to be confirmed by *Confirm* button.

Commands

Columns to hide

Information object address (IOA)IOA (hi/mi/lo)Control codeCommand stringScale exponent100% valueDescription

ConfirmResetAddInsertDeleteExportImport

Search:

Rows count:21 Count of selected rows:0

<input type="checkbox"/>	Information object address (IOA)	IOA (hi/mi/lo)	Control code	Command string	Scale exponent	100% value	
<input type="checkbox"/>	8200	0 / 32 / 8	TI46	RegAUTO=	0	0	Hand/Aut
<input type="checkbox"/>	8193	0 / 32 / 1	TI47	,aa;q20=if,regup=1,else,regdown	0	0	Höher/tie
<input type="checkbox"/>	8194	0 / 32 / 2	TI45	RegSWI=1,	0	0	Sollwert1
<input type="checkbox"/>	8195	0 / 32 / 3	TI45	RegSWI=2,	0	0	Sollwert2
<input type="checkbox"/>	8196	0 / 32 / 4	TI45	RegSWI=3,	0	0	Sollwert3

Figure 29: IEC101 Commands

Table 13: IEC101 Commands

Setting	Format	Range	Default	Description
IOA (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	Information object address, identification of information in IEC telegram
Control code	-	selection of values in combo box	TI45	Information object type (control code)
Command string	text	50 chars	empty	Command string
Scale exponent	-	selection of values in combo box	0	Scale exponent
100% value	decimal	0 to 65535	0	100% value available for TI48 only
Description	text	48 chars	empty	User description

Commands

Columns to hide

Information object address (IOA)IOA (hi/mi/lo)Control codeCommand stringScale exponent100% valueDescription

ConfirmResetAddInsertDeleteExportImport

Search:

Rows count:21 Count of selected rows:0

<input type="checkbox"/>	Information object address (IOA)	IOA (hi/mi/lo)	Control code	Command string	Scale exponent	100% value	
<input type="checkbox"/>	8200	0 / 32 / 8	TI46	RegAUTO=	0	0	Hand/Aut
<input type="checkbox"/>	8193	0 / 32 / 1	TI47	,aa;q20=if,regup=1,else,regdown	0	0	Höher/tie
<input type="checkbox"/>	8194	0 / 32 / 2	TI45	RegSWI=1,	0	0	Sollwert1
<input type="checkbox"/>	8195	0 / 32 / 3	TI45	RegSWI=2,	0	0	Sollwert2
<input type="checkbox"/>	8196	0 / 32 / 4	TI45	RegSWI=3,	0	0	Sollwert3

Figure 30: IEC101 Commands

Table 14: IEC101 Commands

Setting	Format	Range	Default	Description
IOA (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	Information object address, identification of information in IEC telegram
Control code	-	selection of values in combo box	TI45	Information object type (control code)
Command string	text	50 chars	empty	Command string
Scale exponent	-	selection of values in combo box	0	Scale exponent
100% value	decimal	0 to 65535	0	100% value available for TI48 only
Description	text	48 chars	empty	User description

Commands

Columns to hide

DisabledInformation object address (IOA)IOA (hi/mi/lo)Control codeCommand stringRegSys typeScale exponentDescription

ConfirmResetAddInsertDeleteExportImport

Search:

Rows count:35 Count of selected rows:0

<input type="checkbox"/>	Disabled	Information object address (IOA)	IOA (hi/mi/lo)	Control code	Command string	RegSys type	Scale exponent	Description
<input type="checkbox"/>	No	11521	0 / 45 / 1	45	B20 =	BOOL	E0	
<input type="checkbox"/>	No	11522	0 / 45 / 2	45	B21 =	BOOL	E0	

Figure 31: IEC101 Commands REG-PE(D)

Table 15: IEC101 Commands REG-PE(D)

Setting	Format	Range	Default	Description
---------	--------	-------	---------	-------------

Setting	Format	Range	Default	Description
Disabled	-	selection of values in combo box	No	Option to disable the command
IOA (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	Information object address, identification of information in IEC telegram
Control code	-	selection of values in combo box	TI45	Information object type (control code)
Command string	text	50 chars	empty	Command string
RegSys type	-	selection of values in combo box	BOOL	RegSys type of command
Scale exponent	-	selection of values in combo box	0	Scale exponent
100% value	decimal	0 to 65535	0	100% value available for TI48 only
Description	text	48 chars	empty	User description

#### 10.4.4 Editing the IOA in columns

In Order to change the IOA high, middle or low byte in the entire column in the indications or commands table click the right mouse button in the IOA hi/mi/lo table textbox. The following option table will appear on the screen:

Information object address (IOA)	IOA (hi/mi/lo)	Abs deviation	Scale	Max.
8193	0	0		10000
8194	0	0		10000
8195	0	0		10000
8197	0 / 32 / 5	0	1	10000
8198	0 / 32 / 6	1	1	10000

Figure 32: Editing the IOA bytes in entire columns

To set the corresponding bytes to the desired value use the first option.

To increase corresponding bytes by the desired value use the first option.

To decrease corresponding bytes by the desired value use the first option.



**If the increased or decreased value of any of the table rows exceeds the valid range, the function will be aborted and a warning message will appear on the screen.**

### **10.4.5 Status**

Status bits describe bit indication generated by a.eberle device. Bits are arranged in the 32-bit table with predefined meaning of individual lines. Entire table is user-editable. Status bits are available for P1 poll type only.

Status

Confirm

Reset

ID	Comment	IOA	IOA (hi/ni/lo)		
0	Selbsttest-Fehler	0	0	0	0
1	ROM-Fehler	0	0	0	0
2	RAM-Fehler	0	0	0	0
3	EEPROM-A-Fehler	0	0	0	0
4	EEPROM-B-Fehler	0	0	0	0
5	Anwender-Fehler-A	0	0	0	0
6		0	0	0	0
7	Interner Batterie-Fehler	0	0	0	0
8		0	0	0	0
9		0	0	0	0
10	Uv Ausfall	0	0	0	0
11		0	0	0	0
12		0	0	0	0
13	COM1 Kommunikations-Fehler	0	0	0	0
14	COM2 Kommunikations-Fehler	0	0	0	0
15	COM3 Kommunikations-Fehler	0	0	0	0
16	LAN Kommunikations-Fehler	0	0	0	0
17		0	0	0	0
18		0	0	0	0
19		0	0	0	0
20	LAN/L Fehler	0	0	0	0
21	LAN/R Fehler	0	0	0	0
22	LON Fehler	0	0	0	0
23		0	0	0	0
24		0	0	0	0
25		0	0	0	0
26		0	0	0	0
27		0	0	0	0
28	Batterie fast verbraucht	0	0	0	0
29		0	0	0	0
30		0	0	0	0
31		0	0	0	0
multipoint		0	0	0	0

Figure 33: Status bits

Table 16: Meaning of Status bits

ID	German text	English translation
0	Selbsttest-Fehler	Autotest error
1	ROM-Fehler	ROM error
2	RAM-Fehler	RAM error
3	EEPROM-A-Fehler	EEPROM-A error
4	EEPROM-B-Fehler	EEPROM-AB error
5	Anwender-Fehler-A	User error A
7	InternerBatterie-Fehler	Internal battery error
10	UV Ausfall	UV outage
13	COM1 Kommunikations-Fehler	COM1 communication error
14	COM2 Kommunikations-Fehler	COM2 communication error
15	COM3 Kommunikations-Fehler	COM3 communication error
16	LAN Kommunikations-Fehler	LAN communication error
20	LAN/L Fehler	LAN/L error
21	LAN/R Fehler	LAN/R error
22	LON Fehler	LON error
28	Batterie fast verbraucht	Low battery

# 11. Settings – SCADA for IEC103 (REG-P)

IEC103 settings for REG-P telecontrol boards (TK509, TK517, and TK400) are different from settings for REG-PE(D) telecontrol boards (TK860, TK885). This chapter describes IEC103 settings for REG-P in the WinConfig pages, where these settings are different from IEC101. See chapter 11 for description of IEC103 for REG-PE(D) telecontrol boards.

## 11.1 Advanced

### 11.1.1 Settings – SCADA

Settings – SCADA tree branch contains IEC103 specific settings.

IEC103

Interface settings

IEC receiver inverted:

☐

IEC transmitter inverted:

☐

IEC RTS signal inverted:

☐

IEC CTS signal inverted:

☐

IEC RS485 activated:

☐

IEC fiber optics activated:

☐

IEC RS232 used:

☒

Baud rate of serial port IEC [Bd]:

19200

ON time of serial LEDs [10ms]:

1

RTS/CTS

Activate serial RTS/CTS:

☐

Don't activate serial RTS/CTS:

☒

Protocol settings

Link address of REG-P:

1

ASDU address:

1

Inter character timeout [ms]:

4

Timeout after interchar [ms]:

10

IEC address of error multipoint:

function type:

0

information number:

0

Compatibility byte:

2

Identification string:

EBERLE

Identification bytes (0-3)

0

0

0

0

Confirm

Reset

Figure 34: IEC103 specific settings

Table 17: IEC103 settings

Setting	Format	Range	Default	Description
Baud rate of IEC serial	Bd	selection of values in combo box	19200	Baud rate of IEC103 serial port;
ON time of serial LEDs	10 ms	1 to 255	1	ON time of serial LEDs indicating activity on the IEC serial interface
Link address of REG-P	-	1 to 254	1	Link address of REG-P
ASDU address	-	1 to 254	1	ASDU address
Inter character timeout	ms	2 to 100	4	Timeout between two characters in telegram
Timeout after interchar	ms	0 to 255	10	Timeout after interchar timeout expiration
IEC address of error multipoint (function type, information number)	-	0 to 65535 (0 to 255)	0	IEC address (IOA) of multipoint for errors, 0 - undefined
Compatibility byte	-	selection of values in combo box	2	Compatibility byte
Identification string	text	8 chars	empty	Identification string
Identification bytes	-	0 to 255	0	Identification bytes
Activate serial RTS/CTS / Don't activate serial RTS/CTS	-	option box	NOT activated	Activation of RTS/CTS handshaking in the IEC communication (e.g. for driving the modem carrier)
RTS leading time	ms	1 to 255	1	Overlapping of RTS signal before the telegram
RTS trailing time	ms	1 to 255	1	Overlapping of RTS signal after the telegram



## 11.2 Devices

### 11.2.1 Converter Errors

Only one device error is available as IEC103 conversion firmware can manage only one a.eberle device at a time.

Converter errors

Confirm

Reset

ID	Comment	IOA (function type / information number)
0	Device 1 communication error	0 / 0
multipoint		0 / 0

Figure 35: IEC103 converter errors

## 11.3 Device x

### 11.3.1 Device request settings

This tree branch contains IEC103 specific device settings.

Device settings

Identifier of the device:

A:

Poll type:

RPS

Poll string:

RPS 3

IEC COT template:

2

RPS specific

Size of answer:

244

Offset of seconds field:

18

Offset of msec field:

22

Confirm

Reset

Figure 36: IEC103 device request settings

Table 18: IEC103 device settings

Setting	Format	Range	Default	Description
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device as appears in the device communication
Poll type	-	selection of values in combo box	RPS	Device poll type
Poll string	text	23 chars	RPS 3	Device poll string
RPS specific: Size of answer	byte	1 to 255	244	Size of answer
RPS specific: Offset of seconds field	byte	0 to 255	18	Offset of seconds field
RPS specific: Offset of msec field	byte	0 to 255	22	Offset of msec field

## 12. IEC103 settings (REG-PE(D))

Here you are able to set the settings related to IEC60870-5-103.

IEC60870-5-103 protocol is a multipoint protocol. This means that one Master can communicate with multiple Slaves on the same communication line. Due to this a given slave must have a unique ID to which it responds - a device Link address. A slave's device address shall be unique on a given communication network - duplicate addresses lead to bus collision. Device addresses must lie in the range 1 to 254. For broadcast "Send/no reply"-service must be used by master and the Link address field is defined as 255.

One "Frame" contains not more than one Application Service Data Unit (ASDU).

### 12.1 Common

#### 12.1.1 IEC 60870-5-103-Conformity

The size, contents and values of information fields of ASDU (Application Service Data Unit) are set and used according to IEC 60870-5-4/-103.

#### 12.1.2 Supported Type Identifications

The following types are supported:

- Information in monitor direction

Type	PQISYS, REGSYS Devices	EORSYS Devices
<1>:= time-tagged message	✓	✓
<4>:= time-tagged measurements with relative time	✓	✓
<5>:= identification	✓	✓
<6>:= time synchronization	✓	✓
<8>:= general interrogation termination	✓	✓
<9>:= measurements II	✓	✓
<23>:= list of recorded disturbances	×	✓
<26>:= ready for transmission of disturbance data	×	✓
<27>:= ready for transmission of a channel	×	✓
<28>:= ready for transmission of tags	×	✓
<29>:= transmission of tags	×	✓
<30>:= transmission of disturbance values	×	✓
<31>:= end of transmission	×	✓

● Information in control direction

Type	PQISYS, REGSYS Devices	EORSYS Devices
<7>:= general interrogation	✓	✓
<6>:= time synchronization	✓	✓
<20>:= general command	✓	✓
<24>:= order for disturbance data transmission	✓	✓
<25>:= acknowledgement for disturbance data transmission	×	✓

### 12.1.3 Supported Cause of Transmission

● Information in monitor direction

- <1>:= spontaneous
- <2>:= cyclic
- <3>:= reset frame count bit (FCB)
- <4>:= reset communication unit (CU)
- <5>:= start / restart
- <6>:= power on
- <7>:= test mode
- <8>:= time synchronization
- <9>:= general interrogation
- <10>:= termination of general interrogation
- <11>:= local operation
- <12>:= remote operation
- <20>:= positive acknowledgement of command
- <21>:= negative acknowledgement of command
- <31>:= transmission of disturbance data

● Information in control direction

- <8>:= time synchronization
- <9>:= initiation of general interrogation
- <20>:= general command
- <31>:= transmission of disturbance data

### 12.1.4 Topical channel (ACC)

The value from 1 up to 255 are supported

### 12.1.5 Fault Number (FAN)

FAN values are ranged from 0 up to 9999. If FAN amounts to 9999, the application sets next FAN to zero.

#### **12.1.6 Interval between information elements (INT)**

It defines the interval for acquisition of the single information elements is the same for all disturbance data. It is listed in microseconds.

Its values can be set in general IEC settings as “Interval for acquisition in TI26 [microsecond]:”

#### **12.1.7 Compatibility level (COL)**

The compatibility level of protection equipment based on the “Compatibility byte” setting. See figure below. It defined according to on this companion standard and preset to 1.

#### **12.1.8 Number of channels (NOC)**

The value is set to 8 and is constant for EOR-D

#### **12.1.9 Number of information elements of a channel (NOE)**

All channels contain the same number of information elements. This number is transmitted in ASDU 26 ‘ready for transmission of disturbance data’ and set to 2048 for EOR-D by default. This setting can be changed in IEC-settings pane.

#### **12.1.10 Number of tags (NOT)**

The transmission of tag not supported. NOT is preset to 0 as constant.

#### **12.1.11 Number of relevant disturbance values per ASDU (NDV)**

NDV equals 25 for all disturbance channels.

#### **12.1.12 Return information identifier (RII)**

RII is not processed in REG-PE(D) and returned to control center according to IEC-60870-5-103 7.2.6

#### **12.1.13 Scan number (SCN)**

It is used as return identifier in general interrogation responses.

#### **12.1.14 Supplementary information (SIN)**

It can be used as follows:

- By general interrogation as a number of GI request
- By positive or negative acknowledgement of command as RII

#### 12.1.15 Status of fault (SOF)

SOF indicates whether the EOR-D has tripped during the fault (bit one), whether the disturbance data are currently being transmitted (bit two).

Bit 3 (Test) equals 0 and defines “disturbance data recorded during normal operation”.

#### 12.1.16 Tag position (TAP)

It set to 0 as constant.

#### 12.1.17 Type of order (TOO)

REG-PE(D) supports the following types:

- <1> := selection of fault
- <2> := request for disturbance data
- <3> := abortion of disturbance data
- <8> := request for channel
- <9> := abortion of channel
- <16> := request for tags
- <17> := abortion of tags
- <24> := request for list of recorded disturbances
- <32> := end of disturbance data transmission without abortion
- <33> := end of disturbance data transmission with abortion by control system
- <34> := end of disturbance data transmission with abortion by the protection equipment
- <35> := end of channel transmission without abortion
- <36> := end of channel transmission with abortion by control system
- <37> := end of channel transmission with abortion by the protection equipment
- <38> := end of tag transmission without abortion
- <39> := end of tag transmission with abortion by control system
- <40> := end of tag transmission with abortion by the protection equipment
- <64> := disturbance data transmitted successfully (positive)
- <65> := disturbance data transmitted not successfully (negative)
- <66> := channel transmitted successfully (positive)
- <67> := channel transmitted not successfully (negative)
- <68> := tags transmitted successfully (positive)
- <69> := tags transmitted not successfully (negative)

#### 12.1.18 Type of disturbance values (TOV)

It is not used and set to 1. The value is irrelevant.

12.1.19 Binary time

CP32Time2a and CP56Time2a are supported according to IEC 60870-5-4

12.2 Basic settings

The Basic page contains basic settings for IEC103 protocol:

Basic

Settings description: IEC103\_PQID\_IDS

Baud rate of serial port IEC [Bd]:19200

Link address of REG-PE(D):201

ASDU address:201

RS485 activated:☐

Idle mode of fiber optics is switched by accordant setting.

Device	Identifier of device
2	AA:
3	AA:
4	AA:
5	AA:
6	AA:

Confirm

Reset

Figure 37: IEC103 basic settings REG-PE(D)

Table 19: IEC103 basic settings REG-PE(D)

Setting	Format	Range	Default	Description
Settings description	text	50 characters		Short user description of settings file. WinConfig uses text stored in the template file if settings are created from template.
Baud rate of IEC serial	Bd	Selection of values in combo box	38400	Baud rate of IEC103 serial port;
Link address of REG-P	-	1 to 254		Link address in the given range.
ASDU address	-	1 to 254		ASDU address in the given range.
RS485 activated	-	option box	NOT selected	Activation of RS485 interface.
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	strings defined in the Devices tree branch	Device identifier string as appears in the device protocol



**Default values always depend on values entered in the corresponding template.**



## 12.3 Advanced settings

### 12.3.1 IEC103 Settings – SCADA for PQI-D device

IEC103

Interface settings

Serial port:

COM1

Baud rate of serial port IEC [Bd]:

19200

Parity:

EVEN

ON time of serial LEDs [ms]:

10

RS485 activated:

☐

RTS/CTS:

☐

XON/XOFF:

☐

Protocol settings

Link address of REG-PE(D):

201

ASDU address:

201

Send unknown events in GI:

Yes (with Off)

Timeout after command reception [ms]:

1500

First character timeout [ms]:

25

Max. timeout between master requests [s]:

0

IEC address of error multipoint:

function type:

162

information number:

0

IEC address of reset command:

function type:

0

information number:

0

Compatibility byte:

1

Identification string:

EBERLE

Interval between information elements (INT in Type 23) [us]:

293

Max. number of information elements of a channel (NOE in Type 26):

700

Transmission delay for ASDU Type 23 [ms]:

1500

Mode of watchdog LED:

blinking

Test Mode

Test Mode activated:

activated via Command Type 20

Binary Input for Test Mode switching:

15

Test Mode command func. type:

128

Test Mode command info number:

21

Confirm

Reset

Figure 38: IEC103 settings SCADA for PQI-D

Table 20: IEC103 settings SCADA PQI-D

Setting	Format	Range	Default	Description
Serial port		Selection of values in combo box	COM1	Selection of COM ports for IEC103 communication
Baud rate of serial port IEC	Bd	Selection of values in combo box	38400	Baud rate of IEC103 serial port;
Parity	-	Selection of values in combo box	EVEN	Selection of parity of IEC103 communication. Conforming to the IEC 60870-5-103 standard, the program sets the default byte parity to even, sets the number of data bits to 8 and the number of stop bits to 1.
ON time of serial LEDs	ms	1 to 100	10	ON time of serial LEDs
Link address of REG-PE(D)	-	1 to 254	201	Enter the address field for link layer (IEC 60870-5-2 Frame 1.2.). Address must be unique within a shared line, or it may be unique within a group of links sharing a common channel. Value is configurable in the range 0...254. The default value is 1. Value 255 is reserved for broadcast messages with "Send/no reply" coding.
ASDU address	-	1 to 254	201	Enter a Common Address Application Service Data Unit (ASDU). The Common Address shall usually be identical to the address used in the link address. Range of setting is from 0 up to 254. The default value is 1. For broadcast "Send/no reply" - services of the master are mandatory. In this case the ASDU address field is defined as 255. Therefore value 255 is not allowed as specific device address.
Timeout after command reception	[ms]	0 to 65535	1500	The setting determines a maximal waiting time for acknowledgement of the command in control direction. If a command message is received before the previous command has been acknowledged, it will be rejected with negative acknowledgement of command. Commands that cannot be processed for various reasons will be rejected with negative acknowledgement. Value is configurable in the range 0...65535. The default value is 1500. (setting is not used)
First character	ms	0 to	25	Time of first character

Setting	Format	Range	Default	Description
timeout		65535		
Max. timeout between master requests	s	0 to 255	0	Maximum timeout between master enquires
IEC address of error multipoint (function type, information number)	-	0 to 255	162	If a protection device sends the error message and this is not a result of transmission with a control station, REG-PE(D) uses address "error multipoint". "Function type of error multipoint" is the function type of multipoint error address. Value is configurable in the range 0...255. The default value is 162.
IEC address of reset command (function type, information number)	-	0 to 255	0	"Information number of error multipoint" is the information of the multi-point error address. Value is configurable in the range 0-255. The default value is 0.
Identification string	-	8 characters	"EBERLE"	Name of producer of the device at the time of initialization. The maximal length of the string's name is 8 symbols, which may be chosen freely. The default value is "EBERLE"
RS485 activated	-	option box	NOT selected	Activation of RS485 interface.
RTS/CTS activated	-	option box	NOT selected	Activation of Hardware Flow Control.
XONN/XOFF activated	-	option box	NOT selected	Activation of Software Flow Control.
Test Mode activated	-	Selection of values in combo box	activated via Command type 20	Selection of way of activation the test mode. Possible options: deactivated, activated via binary input, activated via Command type 20
Binary Input for Test Mode switching	-	0 to 65535	15	Number of binary input for test mode activation
Test Mode command func. type	-	0 to 255	128	Function type of command for test mode activation
Test Mode command info number	-	0 to 255	21	Information number of command for test mode activation
Interval between information elements (INT in Type 23) [μs]:				The interval for acquisition of the single information elements is the same for all disturbance data. It is listed in microseconds.. Value is configurable in the range 0...65535. The default value is 293. For more information see chapter 7.2.6.7 in IEC 60870-5-103

Setting	For- mat	Range	Default	Description
Max. Number of information elements of a channel (NOE in Type 26):				The number of information elements in each channel. All channels contain the same number of information elements. This number is transmitted in ASDU Type id. 26 'ready for transmission of disturbance data', being valid for all channels.
Inter transmission delay for transmission ASDU Type 23 [ms]:				Value is configurable in the range 0...65535. The default value is 700.



**Default values always depend on values entered in the corresponding template.**

12.3.2 IEC103 Settings – SCADA for EOR-D device

IEC103

Interface settings

Serial port:

COM1

Baud rate of serial port IEC [Bd]:

19200

Parity:

EVEN

ON time of serial LEDs [ms]:

10

RS485 activated:

☐

RTS/CTS

Serial flow control:

Handshake RTS OFF

Protocol settings

Link address of REG-PE(D):

149

ASDU address:

149

Inter character timeout [ms]:

20

Timeout after command reception [ms]:

1500

First character timeout [ms]:

25

IEC address of error multipoint:

function type:

162

information number:

0

IEC address of reset command:

function type:

0

information number:

0

Compatibility byte:

1

Identification string:

EBERLE

Cause of transmission template:

LSA

Interval between information elements (INT in Type 23) [us]:

879

Max. number of information elements of a channel (NOE in Type 26):

700

Transmission delay for ASDU Type 23 [ms]:

1500

Mode of watchdog LED:

blinking

Confirm

Reset

Figure 39: IEC103 settings SCADA for EOR-D

Table 21: IEC103 settings SCADA for EOR-D

Setting	Format	Range	Default	Description
Serial port		Selection of values in combo box	COM1	Selection of COM ports for IEC103 communication
Baud rate of serial port IEC	Bd	Selection of values in combo box	38400	Baud rate of IEC103 serial port;
Parity	-	Selection of values in combo box	EVEN	Selection of parity of IEC103 communication.
ON time of serial LEDs	ms	1 to 100	10	ON time of serial LEDs
Link address of REG-PE(D)	-	1 to 254	201	Link address in the given range.
ASDU address	-	1 to 254	201	ASDU address in the given range.
Inter character timeout	ms	2 to 1000	20	Timeout between two characters
Timeout after command reception	Ms	0 to 65535	1500	Timeout after command reception
First character timeout	ms	0 to 65535	25	Time of first character
Max. timeout between master requests	s	0 to 255	0	Maximum timeout between master enquires
IEC address of error multipoint (function type, information number)	-	0 to 255	162	IEC address (IOA) of multipoint for errors, 0 - undefined
IEC address of reset command (function type, information number)	-	0 to 255	0	IEC address (IOA) of multipoint for errors, 0 - undefined
Compatibility byte	-	Selection of values in combo box	1	Value of compatibility byte
Identification string	-	8 characters	"EBERLE"	Identification string
RS485 activated	-	option box	NOT selected	Activation of RS485 interface option.
Cause of transmission template	-	Selection of values in combo box	LSA	Cause of transmission template
Interval between information elements (INT in Type 23)	μs	0 to 65535	293	Interval between information elements (INT in Type 23)
Max. number of information elements of a channel (NOE in Type 26)	-	1 to 2048	700	Max. number of information elements of a channel (NOE in Type 26)
Transmission delay for ASDU Type 23	ms	0 to 65535	1500	Transmission delay for ASDU Type 23

Setting	Format	Range	Default	Description
Serial flow control	-	Selection of values in combo box	Handshake RTS OFF	Serial flow control

12.3.3 Ethernet-COM-Server

Working additionally as COM-Server the latest REG-PE(D)-type enables users to setup the telecontrol card for remote parameterization or retrieving data of REG-D®(DA)/PQI-D®/EOR-D -devices by WinReg software or for other programs which request data per Ethernet.

The most useful feature of COM-Server is the supporting a shared serial channel mode for IEC control center as well as for WinPQ software at the same time. The TCP/IP access from WinPQ via COM-Server allows a receiving online data

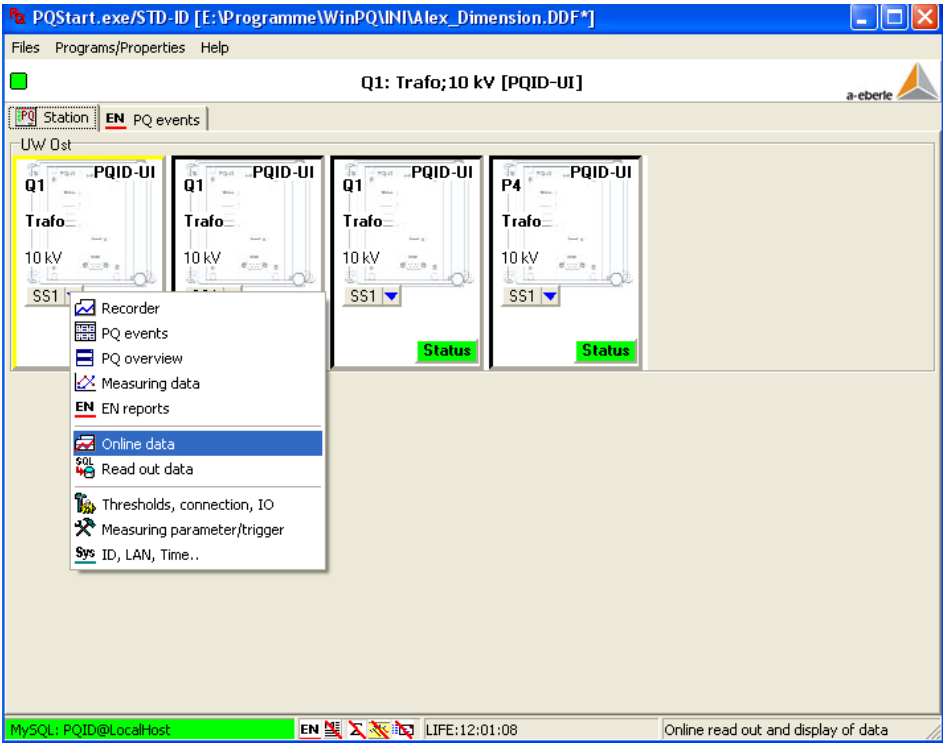


Figure 40: Receiving Online-Data from PQI-D per shared channel COM-Server

We take care of it.

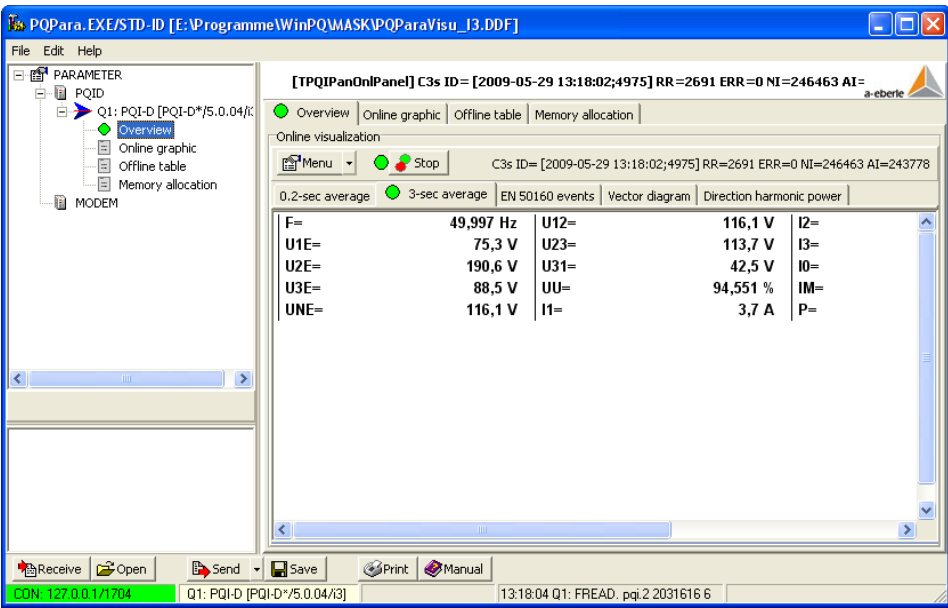


Figure 41: Online data Overview via REG-PE(D) COM-Server ComServer

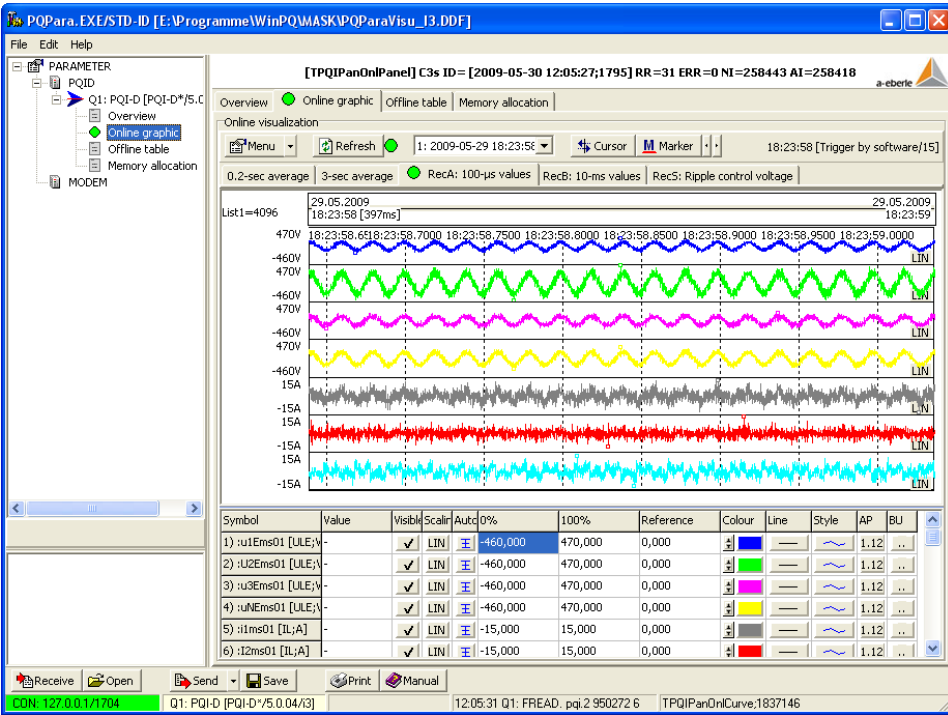


Figure 42: Online graphic disturbance data from PQI-D

With this new type of telecontrol card you are able to have the following operation modes now:

- IEC only
- IEC and COM-Server at the same time where IEC is regarded of higher priority
- COM-Server only

These operation modes are online changeable without need of changing settings, i.e. if you have mostly IEC communication operation mode only you will be able to use from time to



time additionally the COM-Server functionality e.g. for retrieving saved recorder data via WinReg (not supported yet for EORSys and PQI-D). Another application case is an outage of IEC line: in this case you will be able to connect to COM-Server via WinReg and retrieve important data from regulator during the IEC outage.



**The COM-Server also may be used for maintenance purposes with any standard terminal program.**

A disturbance data receiving from PQI-D can last sufficiently long (up to 1-2 min).The IEC control center does not receive the information at same time, because PQI-D gives out the data in output stream. A size of output stream in COM-Server optimized and set to 2 Kbytes. For example, the transmission 110 Kbytes disturbance data per COM-Server needs aboutabout 35 sec.

12.3.4 ComServer settings PQI-D

ComServer settings for PQI-D and also for REG-PE(D) type telecontrol boards shows common parameters in the basic view. To show and edit also parameters intended for advanced user click the *Extend* button. Warning message is displayed before WinConfig shows advanced parameters as change of these parameters can affect the ComServer functionality.

COM-Server

COM-Server

Use COM-Server function:  
Don't use COM-Server function:  
Timeout for response [ms]:

☒

☐

2000

Confirm

Reset

Add

Insert

Delete

Row count: 1

Extend

<input type="checkbox"/>	Activate	Connection type	TCP port	Inactivity timeout [s]	Serial port	Baud rate	Parity	XON/XOFF	RTS/CTS
<input type="checkbox"/>	Yes	Socket	1023	180	COM1	115200	None	No	Yes

To change serial port interface go to "Serial ports assignment" page.

Serial ports assignment

Figure 43: IEC103 advanced settings PQI-D – ComServer

Table 22: IEC103 ComServer settings PQI-D

Setting	Format	Range	Default	Description
Use/Don't use Com-Server function	-	Option box	Don't use	Option to select whether Com-Server will be used

We take care of it.

---

Setting	Format	Range	Default	Description
Timeout for response	ms	1 to 65535	2000	Timeout for response

Table 23: IEC103 ComServer settings PQI-D, Channels

Setting	Format	Range	Default	Description
Activate	-	Yes/No	No	Option to disable the channel
Connection type	-	Selection of values in combo box	RAW	State of channel. (SOCKET, Serial Direct, Telnet, Shared with IEC, OFF)
IP address	-	4x 0 to 255		IP address
TCP port	-	0 to 65535	3003	TCP port
Inactivity timeout	S		180	Timeout after which the serial device is closed if data transfer does not occur. By default is 0. It means that serial device is closed only by closing TCP-Port.
Serial port	-	Selection of values in combo box	COM2	Selection of serial port
Baud rate	Bd	Selection of values in combo box	115200	Baud rate
Parity	-	Selection of values in combo box	Even	Parity
Stop bits	-	Selection of values in combo box	1	Stop bits
Data bits	-	Selection of values in combo box	8	Data bits
XON/XOFF	-	Selection of values in combo box	No	Option to select XON/XOFF handshaking
RTS/CTS	-	Selection of values in combo box	No	Option to select RTS/CTS handshaking
RTS/CTS inverted	-	Selection of values in combo box	No	Option to select inversion of RTS, CTS signals
Rxd/TxD inverted	-	Selection of values in combo box	No	Option to select inversion of RxD, TxD signals
Interface type	-	Selection of values in combo box	RS232	Option to select type of interface
Max. message length	-	0 to 65535	0	Max. message length
Tx blocking time	ms	0 to 65535	0	Tx blocking time

We take care of it.

---

12.3.5 ComServer settings EOR-D

COM-Server

COM-Server

Use COM-Server function:  
Don't use COM-Server function:  
Timeout for response [ms]:

☒

☐

2000

Confirm

Reset

Add

Insert

Delete

Row count: 1

Extend

☐

Activate

Connection type

TCP port

Inactivity timeout [s]

Serial port

Baud rate

Parity

XON/XOFF

RTS/CTS

☐

Yes

Socket

5003

600

COM2

115200

None

No

Yes

To change serial port interface go to "Serial ports assignment" page.

Serial ports assignment

Figure 44: ComServer settings, EOR-D

Table 24: IEC103 ComServer settings EOR-D

Setting	Format	Range	Default	Description
Use/Don't use ComServer function	-	Option box	Don't use	Option to select whether Com-Server will be used
Timeout for response	ms	1 to 65535	2000	Timeout for response
Activate	-	Yes/No	No	Option to disable the channel
Connection type	-	Selection of values in combo box	RAW	State of channel. (SOCKET, Serial Direct, Telnet, Shared with IEC, OFF)
IP address	-	4x 0 to 255		IP address
TCP port	-	0 to 65535	3003	TCP port
Inactivity timeout	S		180	Timeout after which the serial device is closed if data transfer does not occur. By default is 0. It means that serial device is closed only by closing TCP-Port.
Serial port	-	Selection of values in combo box	COM2	Selection of serial port
Baud rate	Bd	Selection of values in combo box	115200	Baud rate
Parity	-	Selection of	Even	Parity

Setting	Format	Range	Default	Description
		values in combo box		
Stop bits	-	Selection of values in combo box	1	Stop bits
Data bits	-	Selection of values in combo box	8	Data bits
XON/XOFF	-	Selection of values in combo box	No	Option to select XON/XOFF handshaking
RTS/CTS	-	Selection of values in combo box	No	Option to select RTS/CTS hand- shaking
RTS/CTS inverted	-	Selection of values in combo box	No	Option to select inversion of RTS, CTS signals
Rxd/TxD inverted	-	Selection of values in combo box	No	Option to select inversion of RxD, TxD signals
Interface type	-	Selection of values in combo box	RS232	Option to select type of inter- face
Max. message length	-	0 to 65535	0	Max. message length
Tx blocking time	ms	0 to 65535	0	Tx blocking time

### 12.3.6 Supervisory settings

IEC103 firmware for TK8xx telecontrol boards can be parameterized to send diagnostic supervisory messages. These messages are sent to the parameterization port of telecontrol board.

Logging level and type of messages can be set in the *Supervisory settings* window contained in the IEC103 settings. Logging level can be set to ERROR, WARNING, INFORMATION or DEBUG mode in the combo box and individual types or messages can be selected by checkboxes.

Supervisory

Trace-options

Level: 

Deactivate

Trace Output

Trace via PARAM-connector (limited capacity due to RS232-bottleneck): ☐

Trace via TCP-Port (recommended): ☒

TCP, File

TCP-Port: 

10689

Log to File (Attention! Available memory on board very limited!): ☐

Logging with Timestamp (Attention! Causes performance reduction!): ☐

General options

Extended Trace for Common Functions:

Parse Settings:

General Warnings and Errors:

General Events:

Process Image:

Time Synchronization (SNTP and Device):

Commands Execution:

Eberle-Device

Verbose Output

Link Layer

Link State Machine

Application Layer

IEC 60870-5-103

Verbose Output

Link Layer

Link State Machine

Application Layer

COM-Server Trace

Activate

☐

Level:

User

Trace via PARAM-Connector (limited capacity due to RS232-bottleneck):

☒

Trace via TCP-Port (recommended):

☐

TCP-Port:

10888

Logging with Timestamp (Performance reduction!):

☒

COM-Server Tx-Rx Mirroring

Activate trace

☐

TCP-port:

23456

Figure 45: Supervisory settings, REG-PE(D)



Table 25: IEC103 Supervisory settings

Setting	Format	Range	Default	Description
Level	-	Selection of values in combo box	Deactivate	Level of Log messages
Trace output	-	radio button	PARAM-connector	Option to trace via PARAM connector or via TCP
General options: Extended Trace	-	checkbox	unchecked	Extended Trace for Common Functions
General options: Parse Settings	-	checkbox	unchecked	Parse Settings
General options: General Warnings	-	checkbox	unchecked	General Warnings and Errors
General options: General Events	-	checkbox	unchecked	General Events
General options: Time Synchronization	-	checkbox	unchecked	Time Synchronization (SNTP and Device)
General options: Process Image	-	checkbox	unchecked	Process Image
General options: Commands Execution	-	checkbox	unchecked	Commands Execution
Eberle-Device: Verbose output	-	checkbox	unchecked	Verbose output
Eberle-Device: Link Layer	-	checkbox	unchecked	Link layer log
Eberle-Device: Link State machine	-	checkbox	unchecked	Link State machine log
Eberle-Device: Application Layer	-	checkbox	unchecked	Application layer log
IEC103: Verbose output	-	checkbox	unchecked	Verbose output
IEC103: Link Layer	-	checkbox	unchecked	Link layer log
IEC103: Link State machine	-	checkbox	unchecked	Link State machine log
IEC103: Application Layer	-	checkbox	unchecked	Application layer log
COM-Server Trace: Activate trace		checkbox	checked	Protocol debug option activation
Level	-	Selection of values in combo box	user	Option to select lever of supervisory messages (user, developer)
Trace via PARAM-Connector)	-	radio button	checked	Logging to PARAM-Connector
Trace via TCP-Port	-	radio button	unchecked	Logging to TCP port

Setting	Format	Range	Default	Description
TCP port	-	1 to 65535	5010	TCP port
Logging with Timestamp	-	checkbox	checked	Logging with Timestamp
Mirroring: Activate	-	checkbox	checked	Activation
TCP-port	-	1 to 65535	5011	TCP port

12.4 Devices

12.4.1 Time synchronization PQI-D

Time synchronization

Strategy of device time synchronization: ☐ all ☒ only attached device ☐ only the following list

UTC character:

List of synchronized devices:

Confirm

Reset

Figure 46: IEC103 Devices, Time synchronization settings, PQI-D

Table 26: IEC103 Devices, Time synchronization settings, PQI-D

Setting	Format	Range	Default	Description
Strategy of device time synchronization	-	Selection of checkboxes	all	Strategy of device time synchronization
UTC character	-	0 to 255	176	UTC character
List of synchronized devices	-	3 characters of device ID	-	List of synchronized devices if <i>only the following list</i> option is used

12.4.2 Time synchronization EOR-D

Time synchronization

Strategy of device time synchronization: ☐ all ☒ only attached device ☐ only the following list

UTC character:

176

List of synchronized devices:

Confirm

Reset

Figure 47: IEC103 Devices, Time synchronization settings, EOR-D

Table 27: IEC103 Devices, Time synchronization settings, EOR-D

Setting	Format	Range	Default	Description
Strategy of device time synchronization	-	Selection of checkboxes	all	Strategy of device time synchronization
UTC character	-	0 to 255	176	UTC character
List of synchronized devices	-	3 characters of device ID	-	List of synchronized devices if <i>only the following list</i> option is used

12.4.3 Internal communication PQI-D

Internal communication

Baud rate of device serial port [Bd]:

115200

Parity:

EVEN

RTS/CTS:

☐

XON/XOFF:

☐

ON time of serial LEDs [ms]:

10

Cycle time of poll [ms]:

300

Wait time for ACK or next sequence frame [ms]:

900

Cycle time of device status check [ms]:

1400

Number of repeats for SYNC cycle:

2

Number of poll repeats:

1

Round time down:

☐

Measurements transmission mode (MEA):

☐ Transmit on reception ☒ Cyclic transmission

Transmit measurement if deviation=0:

☒ Yes ☐ No

Transmission interval of measurements [ms]:

3000

PQI-D version of firmware:

☒ V4.xx, V5.xx ☐ V2.xx, V3.xx

Command executed on startup:

sysopen\_\_\_\_;pqibreset 9;sysreset=0;

Number of polls for IP check:

0

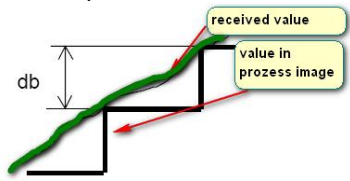
Confirm

Reset

Figure 48: IEC103 Internal communication, PQI-D

Table 28: IEC103 Internal communication, PQI-D

Setting	Format	Range	Default	Description
Baud rate of device serial port	Bd	Selection of values in combo box	115200	Baud rate of device serial port
Parity	-	Selection of values in combo box	EVEN	Parity
ON time of serial LEDs	ms	1 to 65535	10	ON time of serial LEDs
Cycle time of poll	ms	0 to 65535	300	The parameter determines the cycle time of the substation call. If you set the parameter to zero, the call is executed as soon as possible. Value is configurable in the range 0...65535. The default value is 300.

Setting	Format	Range	Default	Description
Wait time for ACK or next sequence frame	ms	0 to 65535	800	This parameter specifies how long the program waits for sequenced next frame (data > 2000 Bytes) or the acknowledgement for command. The wait time is dependent on the baud rate and the maximum message length. Value is configurable in the range 0...65535. The default value is 800.
Cycle time of device status check	ms	0 to 65535	1400	Cycle time of device status check, if connection with device fault
Number of repeats for SYNC cycle		1 to 255	2	Max count of synchronization requests, if serial communication with regulator fails. Value is configurable in the range 0...255. The default value is 3.
Number of poll repeats	-	0 to 255	1	Max. number of the device's polling. The setting is not used to the commands. Value is configurable in the range 0...255. The default value is 1.
Round time down	-	Check box	NOT checked	If value equals 0, time stamps are rounded down in scale of one second to prevent time inconsistencies with substation. If value equals one time stamps are rounded up in scale of one second. The default value is 0.
Measurements transmission mode (MEA)	-	Option boxes	Transmit on reception	Defines a transmitting behavior of the measurands. If "on receiving" checked, all data transmitted forthright after their changing. In this case a cause of transmission will be "spontaneous". If "one time per interval" checked, all measured values transmitted once per interval "Measurements receiving interval". In this case a cause of transmission will be "cyclic" 
Transmission interval of measurements	ms	0 to 65535	1000	Defines a time interval of the cyclic transmitting the measured values. Value is configurable in the range 0...65535. The default value is 1000 ms.
PQI-D version of firmware	-	Option boxes	V2.xx, V3.xx	Defines used version of PQI-D firmware. It is very important setting. Incompatibility of the application setting with topical used PQI-D firmware version gives wrong data and events!

Setting	Format	Range	Default	Description
Command executed on startup of REG-PE(D)	-	64 characters	sys-open__; p qibreset 9;sysreset=0;	Command that will be executed once after first connection with device.
Number of polls for IP check		0 to 255	0	Frequency of interrogation of IP addresses of all devices. Value is configurable in the range 0...255. The default value is 0. (setting is not used)  Setting is applicable only for REG-D device.

12.4.4 Internal communication, EOR-D

Internal communication

Baud rate of device serial port [Bd]:

115200

Parity:

EVEN

ON time of serial LEDs [ms]:

10

Timeout for reception of first char [ms]:

90

Inter character timeout [ms]:

80

Time to wait after answer rec. [ms]:

30

Number of repeats for SYNC cycle:

2

Number of poll repeats:

1

Round time down:

☐

Number of polls for IP check:

16

Earth faults

Earth fault acquisition [on/off]:

☒ Yes ☐ No

Initial delay of first sample request [ms]:

2000

Earth fault acquisition timeout [sec]:

100

Delay of receiving sample from device [ms]:

500

Delay of List Records transmission [ms]:

300

Sampling rate divisor [1...3]:

3

Full-scale valuation in records:

32767

Confirm

Reset

Figure 49: IEC103 Devices, EOR-D, Internal communication

Table 29: IEC103 Devices, EOR-D, Communication settings

Setting	Format	Range	Default	Description
Baud rate of device serial port	Bd	Selection of values in combo box	115200	Baud rate of device serial port
Parity	-	Selection of values in combo box	EVEN	Parity
ON time of serial LEDs	ms	1 to 65535	10	ON time of serial LEDs
Inter character timeout	ms	1 to 65535	80	Inter character timeout
Time to wait after answer rec.	ms	1 to 65535	30	Time to wait after answer reception
Number of repeats for SYNC cycle		1 to 255	2	Number of repeats for SYNC cycle
Number of poll repeats	-	0 to 255	1	Number of poll repeats
Round time down	-	Check box	NOT checked	Round time down
Number of polls for IP check		0 to 255	16	Frequency of interrogation of IP addresses of all devices. Value is configurable in the range 0...255. The default value is 0. (setting is not used)
Earth fault acquisition [on/off]	ms	Option boxes	Yes	Earth fault acquisition activate. If "On" set, all data with earth-faults will be transmitted from current device to control center. Otherwise this feature not supported and off. Note: the feature supported now only for EORSys® devices.
Initial delay of first sample request	ms	0 to 65535	2000	Max. wait for repetition of the initial state of device to start state machine. Value is configurable in the range 0...65535. The default value is 800 ms.
Earth fault acquisition timeout	s	0 to 65535	100	Max. wait for repetition of new Earth-Faults samples request from device to start "get mode". Value is configurable in the range 0...65535. The default value is 100 sec.
Delay of List Records transmission	ms	0 to 65535	300	Min. timeout in device response in Earth-Faults transmit to control center with type identification 30 according to standard IEC 60870-5-103 . Value is configurable in the range 0...65535. The default value is 300 ms.

Setting	Format	Range	Default	Description
Sampling rate divisor [1...3]	-	1 to 5	3	Defines a sampling frequency factor (instance for value 2: 2 Samples of three each are deleted).  Value is configurable in the range 0...65535. The default value is 3.
Full-scale valuation in records	-	1 to 1000000	32767	Defines the maximum amplitude a disturbance data can present.  If the amplitude exceeds the limit, REG-PE(D) halves the maximum amplitude to ensure the values up to “Full-scale valuation”.  Value is configurable in the range 1...32767. The default value is 32767.

## 12.5 Device x

### 12.5.1 Device settings

Device Request Settings

Data class used:

☒ Yes ☐ No

Identifier of device:

Q1:

Data class:

2( C\_3s\_1 interval 3 sec)

Class type:

Interval

Number of read 256-byte records:

1

Comment:

C\_3s\_1 3 sec

Confirm

Reset

Figure 50: IEC103 Device x, PQI-D



Table 30: IEC103 Device x, Device settings PQI-D

Setting	Format	Range	Default	Description
Data class used	-	Option boxes	Yes	Usage of Data class
Identifier of device	-	3 characters	Q1:	Identifier of device
Data class	-	Selection of values in combo box	1(C_s2_1 interval 200 ms)	Data class
Class Type	-	Selection of values in combo box	Interval	The poll type of logical device. It is the characteristic of the delivered setting's set. Do not change the setting without confirmation of Eberle staff.
Number of read 256-byte records	-	Selection of values in combo box	1	Defines a number of the entries replayed in one request.
Comment	-	23 characters	C_c2_1 200 ms	Comment

### Device Request Settings

Data class used: ☒ Yes ☐ No

Identifier of device:

Device role: ☒ Master ☐ Slave

Mapped in data points: ☒ in master ☐ self

Poll string:

Size of answer [byte]:

Type of seconds field:  ▼

Offset of seconds field [byte]:

Type of msec field:  ▼

Offset of msec field [byte]:

Earth-faults acquisition: ☒ active ☐ ignore

Number of fault files:

Function ID for faults:

Comment:

Figure 51: IEC103 Device x, Device settings EOR-D

Table 31: IEC103 Device x, Device settings EOR-D

Setting	Format	Range	Default	Description
Data class used	-	Option boxes	Yes	Usage of Data class
Identifier of device	-	3 characters	E1:	Identifier of device
Device role	-	Option boxes	In master	Device role
Poll string	-	24 characters	eormess 11	Poll string
Size of answer	byte	1 to 255	118	Size of answer:
Type of seconds field	-	Selection of values in combo box	INT32U	Type of seconds field
Offset of seconds field	byte	0 to 255	0	Offset of seconds field
Type of msec field	-	Selection of values in combo box	INT16U	Type of seconds field
Offset of msec field	byte	0 to 255	4	Offset of msec field
Earth-faults acquisition	-	Option boxes	active	If “active” selected, all data with earth-faults will be transmitted from current device to control center. Otherwise this feature not supported. Note: feature is supported only for EORSys® devices.
Number of fault files		0 to 255	1	Maximal number of Samples files in the EORSys® device. Value is configurable in the range 0...8. The default value is 3.
Function ID for faults		0 to 255	151	IEC functional identify for current device. Instance in a 19”-rack had mounted three EOR-D devices. For first EOR-D Functional Id. 151 is set, for second – 152 and for third – 153. It is needed for an identification disturbance data on the control center’s side.
Comment	-	23 characters	EOR-D	Comment

## 12.5.2 Data points – indications, PQI-D

**Indications**

Columns to hide:
 Description
Disabled
IOA (function type / information number)
IEC object type
MEA number in ASDU
Processing of changes
REG.type/Bit offset

100%
Use in GI
Send once initial value

Confirm
Reset
Add
Insert
Delete
Export
Import
Advanced

Search: 
Row count: 18 Count of selected rows: 0

	Description	Disabled	IOA (function type / information number)	IEC object type	MEA number
<input type="checkbox"/>	[256] : F	No	18 / 1	Type 4: Time-tagged measurands with relative time	not defined
<input type="checkbox"/>	[1024] : U1E	No	1 / 1	Type 4: Time-tagged measurands with relative time	not defined
<input type="checkbox"/>	[1025] : U2E	No	2 / 1	Type 4: Time-tagged measurands with relative time	not defined
<input type="checkbox"/>	[1026] : U3E	No	3 / 1	Type 4: Time-tagged measurands with relative time	not defined
<input type="checkbox"/>	[1027] : UNE	No	4 / 1	Type 4: Time-tagged measurands with relative time	not defined
<input type="checkbox"/>	[1028] : U12	No	5 / 1	Type 4: Time-tagged measurands with relative time	not defined
<input type="checkbox"/>	[1029] : U23	No	6 / 1	Type 4: Time-tagged measurands with relative time	not defined

Figure 52: IEC103 Device x, Indications, PQI-D

Table 32: IEC103 Device x, Indications, PQI-D

Setting	Format	Range	Default	Description
Disabled	-	Option boxes	No	Enabling/disabling of individual data point
IOA (function type / information number)	-	2x 0 to 255	0	The corresponding IEC data type must be entered. The Type Identification is used for the compatible range.
IEC object type	-	Selection of values in combo box	Type 1: Time-tagged message	IEC 60870-5-103 type of data
MEA number in ASDU	-	Selection of values in combo box	not defined	Information order number of Common Address Application Service Data Unit (ASDU). It is applied only to type 3 and 9.
Processing of changes	-	Selection of values in combo box	value	Processing of changes. Should be set to value for EOR-D device type.
REG data type	-	Selection of values in combo box	BIT0	Selection of regulator data type
RPS offset	-	0 to 255	0	Definition of RPS offset
Channel number	-	0 to 255	0	Channel number
Data structure type	-	Selection of values in combo box	Measured [FLT]/Event	Data structure type
Dead band	%	float	1	Dead band defines threshold to save new value in process im-

We take care of it.

---

Setting	Format	Range	Default	Description
				age and to send spontaneous message
Scale	-	float	1	Scale exponent value
Value normalized for 100%	-	float	3	Max. value of data point accepted in the device communication
Use in GI	-	Selection of values in combo box	No	Option whether the data point will be used in GI
Initial value transmission	-	Selection of values in combo box	No	Initial value transmission
Description	string	50 characters	empty string	User description of data point

### 12.5.3 Indications, EOR-D

## Indications

Columns to hide

Description
IEC object type
RegSys type
IOA (function type / information number)
Abs. deviation
Scale
Max. value
RPS offset

Confirm
Reset
Add
Insert
Delete
Export
Import
Advanced

Search:
Row count: 248 Count of selected rows: 0

	Description	IEC object type	RegSys type	IOA (function type / information number)	Abs. deviation	Scale	Max. value
<input type="checkbox"/>	Status_Status	TI1	Bit	2 / 1	0	1	0
<input type="checkbox"/>	Störung_Fault	TI1	Bit	3 / 1	0	1	0
<input type="checkbox"/>	Slave fehlt_slave missing	TI1	Bit	4 / 1	0	1	0
<input type="checkbox"/>	Allg. Erdschl. erkannt_general earth fault ident	TI1	Bit	1 / 1	0	1	0
<input type="checkbox"/>	Wischer Sammelmeldung_Transient generalsignal	TI1	Bit	5 / 1	0	1	0

Figure 53: IEC103 Device x, Indications, EOR-D

Table 33: IEC103 Device x, Data points – indications, EOR-D

Setting	Format	Range	Default	Description
Disabled	-	Option boxes	No	Enabling/disabling of individual data point
IOA (function type / information number)	-	2x 0 to 255	0	IEC address (IOA) of indication
IEC object type	-	Selection of values in combo box	Type 1: Time-tagged message	IEC data type of data point
Processing of changes	-	Selection of values in combo box	value	Processing of changes. Should be set to value for EOR-D device type.
REG data type	-	Selection of values in combo box	BIT0	Selection of regulator data type
RPS offset	-	0 to 255	0	Definition of RPS offset
Dead band	%	float	1	Dead band defines threshold to save new value in process image and to send spontaneous message
Scale	-	float	1	Scale exponent value
Value normalized for 100%	-	float	1	Max. value of data point accepted in the device communication
Use in GI		Selection of values in combo box	No	Option whether the data point will be used in GI
Offset connected with remote	-	0 to 65535	1	REG-D/EOR-D specific setting. Definition of data offset in the case of

Setting	Format	Range	Default	Description
COT				remote cause of the transition (COT). If 0, the data point will not be mapped to remote operation.
Remote COT bits of remote offset	-	0 to 255	0	Remote COT bits of remote offset
Feeder	string	50 characters	empty	Feeder
Description	string	50 characters	empty string	User description of data point

## 12.5.4 Commands

Commands

Columns to hide

Disabled

IOA (function type / information number)

Control code

Command string

RegSys type

Scale exponent

Use method of command value

Description

Confirm

Reset

Add

Insert

Delete

Export

Import

Search:

Rows count: 25 Count of selected rows: 0

Disabled	IOA (function type / information number)	Control code	Command string	RegSys type	Scale exponent	Use method of command value
<input type="checkbox"/>	---	---	---	---	---	---
<input type="checkbox"/>	No 110 / 17	Type 20: General command	regcootb = 1, RegHoehere=	BOOLEAN	1: Double command without space, inverted	Applied in com
<input type="checkbox"/>	No 110 / 18	Type 20: General command	regcootb = 1, RegTiefer=	BOOLEAN	1: Double command without space, inverted	Applied in com
<input type="checkbox"/>	No 110 / 19	Type 20: General command	regcootb = 2, RegSWI=	BOOLEAN	1: Double command without space, inverted	Applied in com

Figure 54: IEC103 Device x, Commands

Table 34: IEC103 Device x, Data points – commands

Setting	Format	Range	Default	Description
Disabled	-	Option boxes	Yes	Enabling/disabling of individual data point
IOA (function type / information number)	-	2x 0 to 255	0	The corresponding IEC data type must be entered. The Type Identification is used for the compatible range.
Control code	-	Selection of values in combo box	Type 20: General command	IEC 60870-5-103 type of data
Command string	string	50 characters	empty string	Command string to be sent to device
REG data type	-	Selection of values in combo box	INT8	Device data type of command
Scale exponent	-	Selection of values in combo box	0	Normally, scale is used as exponent with single commands. Only if Maximal Value is 0 scale has Double Point type: with<0> := not used, <1> := OFF, <2> := ON, <3> := not used. In either case scale is an enumeration.
Use method of command value	-	Selection of values in	Applied in command	Application method of command value. If "ignored" is selected, command

Setting	Format	Range	Default	Description
		combo box		value will be ignored.
Description	-	50 characters	empty string	User description of command

### 12.5.5 Fault records

The terms earth-faults and channels are used to describe particular of a single channel in an IEC 60870-5-103 sense.

Using WinEDC software is able to get sample files saved in inner EOR-D memory. Data can be saved in COMTRADE or CSV (comma separated) files.

Earth fault channels page contains parameterization of transmission disturbances.

**Fault records**

Rows count: 8

<input type="checkbox"/>	Disabled	Channel	Reference factor	Rated primary value	Rated secondary value	Data type	Offset	Request command string
<input type="checkbox"/>	No	64	0.001	1	1	INT32	4	EorKni 1
<input type="checkbox"/>	No	65	0.001	1	1	INT32	5	EorKni 2
<input type="checkbox"/>	No	66	0.001	1	1	INT32	6	EorKni 3
<input type="checkbox"/>	No	67	0.001	1	1	INT32	7	EorKni 4

Figure 55: IEC103 Device x, Fault records, EOR-D

Table 35: IEC103 Device x, Fault records, EOR-D

Setting	Format	Range	De- fault	Description
Disabled	-	Option boxes	Yes	Enabling/disabling of individual data point
Channel	-	0 to 255	64	According to IEC 60870-5-103, the number of channels indicates the number of analogue channels in transmission data (NOC Number).
Reference factor	-	float	1	Reference factor (RFA) defined in 7.2.6.17 IEC 60870-5-103©  RFA is pre-set to 0.001. REG-PE(D) calculates the additional factors for each channel to limit values in range up to 31767 (two bytes). Then this additional factor is multiplied with preset RFA. The result is transmitted as IEC "Reference factor".
Rated primary value	-	float	1	Rated primary value (RPV) defined in 7.2.6.18 IEC 60870-5-103©  The value is calculated for each set channel using EOR-D factor commands "EorKni X" or "EorKnu Y" accordingly with type of channel (voltage or current)

Setting	Format	Range	De- fault	Description
Rated secondary value	-	float	1	Rated secondary value (RSV) defined in 7.2.6.19 IEC 60870-5-103© Value set to 1 for EORSys™.
Data type	-	Selection of values in combo box	INT8	Device data type
Offset	-	0 to 7	12	Channel data offset in Records
Request command string	-	63 characters	empty string	Factor request command string
Description	-	63 characters	empty string	User description

The conformity of IEC-channels and earth-fault channels of EOR-D shown in figure below.  
EOR-D earth-fault record is able to read and to save in COMTRADE or comma-separated (CSV) file format.

The data mapping of channels particular are explained on an example.

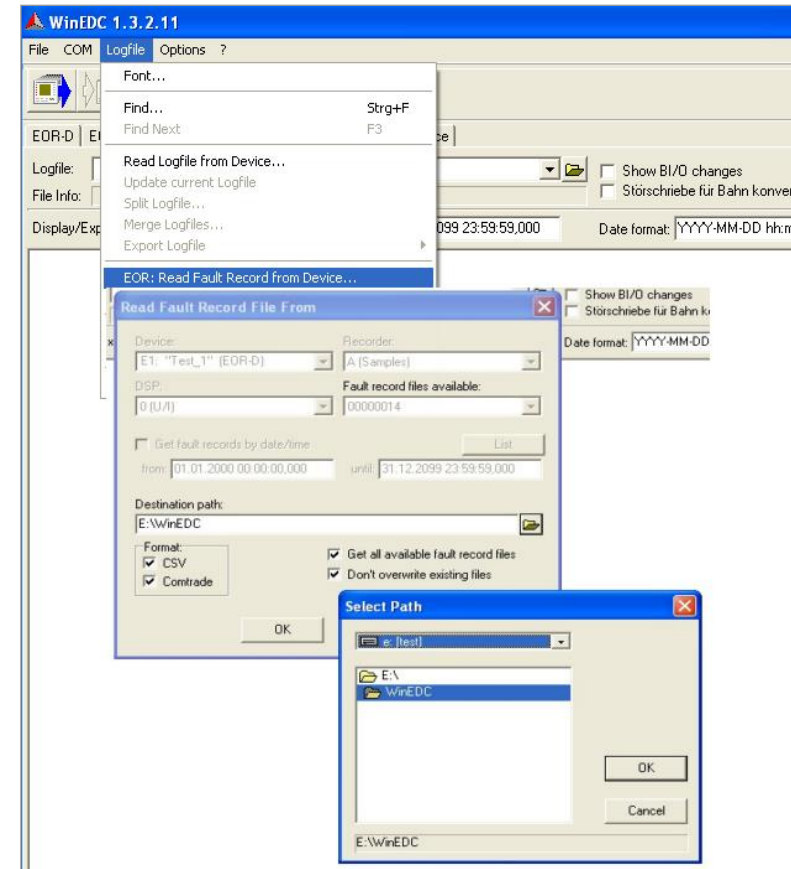


Figure 56: Read Faults Record from EOR-D

With the help of WinEDC program (see Figure above) records data from EOR-D device “E1” saved to CSV-file. The IEC-channel data are located in the column “i1”.





### 12.5.6 EOR-D® defined settings

The meaning of offset is explained in table below.

“i1”- earth-faults values are located in the faults record with begin offset 4.

Table 36: Channel offset term

1320	11540	1	0					
1	0	0	0					
963	0	0	0					
383,73	0	0	0					

Data from WinEDC CSV-file:

Index	u1	u2	u3	u4	i1	i2	i3	i4
0	-2233	-2488	-4	-43	489	-1	0	0
1	645	-2488	-29	-92	450	-1	0	-1
2	-2233	-2488	-4	-43	359	-1	-1	-1
3	-5111	-2488	21	-43	359	-1	-1	-1
4	-5111	-2488	-29	-92	359	-1	-1	-1
5	-5111	-2488	-29	-43	359	-1	0	-1
6	645	-2488	194	406	489	-1	0	-1

Description:

Offset	0	1	2	3	4	5	6	7
--------	---	---	---	---	---	---	---	---

### 12.5.7 Single disturbance value (SDV)

SDV := F16[1..16] <-1..+1-2<sup>-15</sup>> is defined and calculated according to IEC requirements.

The raw-values are transmitted as integer in range from – 32768 up to 32767 and then normalized to -1.0 ... +1.0.

## 13. IEC104 settings

IEC 104 settings are available only for TK860 and TK885D telecontrol boards. Chapter IEC104 settings describes only settings not described above.

### 13.1 Basic

The *basic settings* tree branch contains table of 20 available IEC104 channels. Each IEC104 channel can be operated in client or server modes, the channel mode assumes corresponding remote side with corresponding remote IP addresses and remote ASDUs, i.e. IEC104 remote client for server mode and IEC104 server for client mode.

Basic

Settings description: IEC104\_REGD\_BASIC

IEC104 Channels

	Enabled	Remote IP Address	Remote ASDU Address	Client/Server Mode
1	<input checked="" type="checkbox"/>	192.168.1.92	1	top_server
2	<input checked="" type="checkbox"/>	192.168.1.64	1	top_server
3	<input checked="" type="checkbox"/>	192.168.1.43	1	top_server
4	<input type="checkbox"/>	0.0.0.0	1	top_server
5	<input type="checkbox"/>	0.0.0.0	1	top_server
6	<input type="checkbox"/>	0.0.0.0	1	top_server
7	<input type="checkbox"/>	0.0.0.0	1	top_server
8	<input type="checkbox"/>	0.0.0.0	1	top_server
9	<input type="checkbox"/>	0.0.0.0	1	top_server
10	<input type="checkbox"/>	0.0.0.0	1	top_server
11	<input type="checkbox"/>	0.0.0.0	1	top_server
12	<input type="checkbox"/>	0.0.0.0	1	top_server
13	<input type="checkbox"/>	0.0.0.0	1	top_server
14	<input type="checkbox"/>	0.0.0.0	1	top_server
15	<input type="checkbox"/>	0.0.0.0	1	top_server
16	<input type="checkbox"/>	0.0.0.0	1	top_server
17	<input type="checkbox"/>	0.0.0.0	1	top_server
18	<input type="checkbox"/>	0.0.0.0	1	top_server
19	<input type="checkbox"/>	0.0.0.0	1	top_server
20	<input type="checkbox"/>	0.0.0.0	1	top_server

ASDU address: 1 ( ASDU hi: 0 ASDU lo: 1 )

Device	Identifier of device
1	AA:

Figure 57: IEC104 basic settings

Table 37: IEC104 settings

Setting	Format	Range	Default	Description
Settings description	text	50 characters	Filename of open settings	Short user description of settings file or name of settings file.
Enabled	-	checkbox	unchecked	Option to enable/disable the corresponding IEC104 channel
Remote IP address	-	4x 0 to 255	192.168.1.68 192.168.1.64 192.168.1.43	IP addresses of remote station authorized for connection with telecontrol board
Remote ASDU address	-	0 to 65534	1	ASDU address of remote station authorized for connection with telecontrol board
ASDU address (ASDU2, ASDU1)	-	0 to 65534 or 0 to 255	1	ASDU address
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device

## 13.2 Advanced

### 13.2.1 Settings - SCADA

IEC104 Settings - SCADA tree branch contains complete IEC104 specific settings.

IEC104

Interface settings

Port: 2404

Protocol settings

IEC104 Channels

	Enabled	Remote IP Address	Remote ASDU Address	Client/Server Mode
1	<input checked="" type="checkbox"/>	192.168.1.92	1	top_server
2	<input checked="" type="checkbox"/>	192.168.1.84	1	top_server
3	<input checked="" type="checkbox"/>	192.168.1.43	1	top_server
4	<input type="checkbox"/>	0.0.0.0	1	top_server
5	<input type="checkbox"/>	0.0.0.0	1	top_server
6	<input type="checkbox"/>	0.0.0.0	1	top_server
7	<input type="checkbox"/>	0.0.0.0	1	top_server
8	<input type="checkbox"/>	0.0.0.0	1	top_server
9	<input type="checkbox"/>	0.0.0.0	1	top_server
10	<input type="checkbox"/>	0.0.0.0	1	top_server
11	<input type="checkbox"/>	0.0.0.0	1	top_server
12	<input type="checkbox"/>	0.0.0.0	1	top_server
13	<input type="checkbox"/>	0.0.0.0	1	top_server
14	<input type="checkbox"/>	0.0.0.0	1	top_server
15	<input type="checkbox"/>	0.0.0.0	1	top_server
16	<input type="checkbox"/>	0.0.0.0	1	top_server
17	<input type="checkbox"/>	0.0.0.0	1	top_server
18	<input type="checkbox"/>	0.0.0.0	1	top_server
19	<input type="checkbox"/>	0.0.0.0	1	top_server
20	<input type="checkbox"/>	0.0.0.0	1	top_server

ASDU address:

1

( ASDU hi: 0 ASDU lo: 1 )

Errors data type:

TI30

IEC address of error multipoint:

162

( hi: 0 mi: 0 lo: 162 )

Reject commands with unknown address:

☐

Max. telegram length:

240

k-Value:

12

w-Value:

8

t0-Timeout [s]:

30

Figure 58: IEC104 Settings - SCADA

Table 38: IEC104 settings - SCADA

Setting	Format	Range	Default	Description
Port	-	1 to 65535	2404	TCP port for IEC104 connection
Enabled	-	checkbox	unchecked	Option to enable/disable the corresponding IEC104 channel
Remote IP address	-	4x 0 to 255	192.168.1.68 192.168.1.64 192.168.1.43	IP addresses of remote station authorized for connection with telecontrol board
Remote ASDU address	-	0 to 65534	1	ASDU address of remote station authorized for connection with telecontrol board
ASDU address (ASDU2, ASDU1)	-	1 to 65534 or 0 to 255	62166	ASDU address
Errors data type	-	selection of values in combo box	TI30	IEC data type of errors
IEC address of error multipoint	-	0 to 16777215 or 3x 0 to 255	0/0/162	IEC address (IOA) of multipoint for errors
Reject commands with unknown address	-	option box	Not selected	Reject commands with unknown address (otherwise ignore)
Port	-	1 to 65535	2404	TCP Port
Max. telegram length	-	1 to 249	240	Maximum telegram length
k-Value	-	1 to 32767	12	Max. No. of invalidated APDUs
w-Value	-	1 to 32767	8	Acknowledge latest after this number of APDUs, $w \leq 2/3k$
t0-Timeout	s	1 to 255	30	Timeout for connection establishment
t1-Timeout	s	1 to 255	15	Timeout for send or test APDUs
t2-Timeout	s	1 to 255	10	Timeout for acknowledgement in the case of no messages $t2 < t1$
t3-Timeout	s	1 to 255	20	Timeout for sending test frames in case of idle state

### 13.2.2 ComServer settings

IEC104 advanced settings tree branch contains ComServer specific settings.

COM-Server

Confirm

Reset

Add

Insert

Delete

Row count:1

Extend

<input type="checkbox"/>	Activate	Connection type	TCP port	Inactivity timeout [s]	Serial port	Baud rate	Parity	XON/XOFF	RTS/CTS
<input type="checkbox"/>	Yes	Socket	5004	600	COM3	115200	None	No	Yes

To change serial port interface go to "Serial ports assignment" page.

Serial ports assignment

Figure 59: IEC104 ComServer settings

Table 39: IEC104 ComServer settings

Setting	Format	Range	Default	Description
Activate	-	Yes/No	No	Option to disable the channel
Connection type	-	Selection of values in combo box	RAW	State of channel. (SOCKET, Serial Direct, Telnet, Shared with IEC, OFF)
IP address	-	4x 0 to 255		IP address
TCP port	-	0 to 65535	3003	TCP port
Inactivity timeout	S		180	Timeout after which the serial device is closed if data transfer does not occur. By default is 0. It means that serial device is closed only by closing TCP-Port.
Serial port	-	Selection of values in combo box	COM2	Selection of serial port
Baud rate	Bd	Selection of values in combo box	115200	Baud rate
Parity	-	Selection of values in combo box	Even	Parity
Stop bits	-	Selection of values in combo box	1	Stop bits
Data bits	-	Selection of values in combo box	8	Data bits
XON/XOFF	-	Selection of	No	Option to select XON/XOFF



Setting	Format	Range	Default	Description
		values in combo box		handshaking
RTS/CTS	-	Selection of values in combo box	No	Option to select RTS/CTS hand- shaking
RTS/CTS inverted	-	Selection of values in combo box	No	Option to select inversion of RTS, CTS signals
Rxd/TxD inverted	-	Selection of values in combo box	No	Option to select inversion of RxD, TxD signals
Interface type	-	Selection of values in combo box	RS232	Option to select type of inter- face
Max. message length	-	0 to 65535	0	Max. message length
Tx blocking time	ms	0 to 65535	0	Tx blocking time

### **13.2.3 Supervisory settings**

The Supervisory settings tree branch can be used for activation and configuration of debug logs.

## Supervisory

Debug options

Logging Type

Level: 

Deactivate

Trace Output

Trace via PARAM-connector (limited capacity due to RS232-bottleneck): ☒

Trace via TCP-Port (recommended): ☐

General options

Extended Trace for Common Functions:

☐

Parse Settings:

☐

General Warnings and Errors:

☐

General Events:

☐

Time Synchronization (SNTP and Device):

☐

Process Image:

☐

Commands Execution:

☐

Eberle-Device

Verbose Output:

☐

Link Layer:

☐

Link State Machine:

☐

Application Layer:

☐

IEC Protocol

Verbose Output:

☐

Link Layer:

☐

Link State Machine:

☐

Application Layer:

☐

COM-Server Trace

Activate trace

☐

Level:

User

Trace via PARAM-Connector (limited capacity due to RS232-bottleneck):

☒

Trace via TCP-Port (recommended):

☐

TCP-Port:

5010

Logging with Timestamp (Performance reduction!):

☐

COM-Server Tx-Rx Mirroring

Activate

☐

TCP-port:

5011

Confirm

Reset

Figure 60: IEC104 Supervisory settings

Table 40: IEC104 Supervisory settings

Setting	Format	Range	Default	Description
Level	-	Selection of values in combo box	Deactivate	Level of Log messages
Trace output	-	radio button	PARAM-connector	Option to trace via PARAM connector or via TCP
General options: Extended Trace	-	checkbox	unchecked	Extended Trace for Common Functions
General options: Parse Settings	-	checkbox	unchecked	Parse Settings
General options: General Warnings	-	checkbox	unchecked	General Warnings and Errors
General options: General Events	-	checkbox	unchecked	General Events
General options: Time Synchronization	-	checkbox	unchecked	Time Synchronization (SNTP and Device)
General options: Process Image	-	checkbox	unchecked	Process Image
General options: Commands Execution	-	checkbox	unchecked	Commands Execution
Eberle-Device: Verbose output	-	checkbox	unchecked	Verbose output
Eberle-Device: Link Layer	-	checkbox	unchecked	Link layer log
Eberle-Device: Link State machine	-	checkbox	unchecked	Link State machine log
Eberle-Device: Application Layer	-	checkbox	unchecked	Application layer log
IEC protocol: Verbose output	-	checkbox	unchecked	Verbose output
IEC protocol: Link Layer	-	checkbox	unchecked	Link layer log
IEC protocol: Link State machine	-	checkbox	unchecked	Link State machine log
IEC protocol: Application Layer	-	checkbox	unchecked	Application layer log
COM-Server Trace: Activate trace		checkbox	checked	Protocol debug option activation
Level	-	Selection of values in combo box	user	Option to select lever of supervisory messages (user, developer)
Trace via PARAM-Connector)	-	radio button	checked	Logging to PARAM-Connector

Setting	Format	Range	Default	Description
Trace via TCP-Port	-	radio button	unchecked	Logging to TCP port
TCP port	-	1 to 65535	5010	TCP port
Logging with Timestamp	-	checkbox	checked	Logging with Timestamp
Mirroring: Activate	-	checkbox	checked	Activation
TCP-port	-	1 to 65535	5011	TCP port

13.3 Linked Devices

Devices

Device	Enabled	Identifier of device	Poll type
1	<input checked="" type="checkbox"/>	AA:	RPS
2	<input type="checkbox"/>		RPS
3	<input type="checkbox"/>		RPS
4	<input type="checkbox"/>		RPS
5	<input type="checkbox"/>		RPS
6	<input type="checkbox"/>		RPS
7	<input type="checkbox"/>		RPS
8	<input type="checkbox"/>		RPS

Confirm

Reset

Figure 61: IEC104 Linked devices

13.3.1 Time synchronization

IEC104 time synchronization tree branch contains IEC104 specific settings for time synchronization.

Time synchronization

Time source:

☒ NTP ☐ IEC

Synchronize all devices connected to ELAN:

☐

Sync. period of connected devices [min]:

1

NTP specific

NTP primary server IP address:

0.0.0.0

NTP secondary server IP address:

0.0.0.0

Confirm

Reset

Figure 62: IEC104 time synchronization settings

Table 41: IEC104 time synchronization

Setting	Format	Range	Default	Description
Time source	-	option box	NTP	Time source selection
Sync. all devices connected to ELAN	-	option box	Not selected	Sync. all devices connected to ELAN
Sync. period of connected devices	min	0 to 999	1	Sync. period of connected devices (0 = disabled)
NTP primary server IP address	-	4x 0 to 255	0.0.0.0	NTP primary server IP address
NTP secondary server IP address	-	4x 0 to 255	0.0.0.0	NTP secondary server IP address

### 13.3.2 Internal Communication

Communication settings tree branch contains communication settings of devices for TK8xx board types and IEC104 protocol conversion.

Internal communication

Baud rate of device serial port [Bd]:

115200

ON time of serial LEDs [10ms]:

2

Timeout for reception of first char [10ms]:

20

Inter character timeout [10ms]:

12

Number of repeats for SYNC cycle:

6

Number of poll repeats:

6

Discard cmd. buffer after TI30/TI31 error:

☐

Time to wait after answer rec. [ms]:

0

Timeout for analogs cyclic sending [s]:

0

Time to stop device interrogation [s]:

0

Round time down:

☒

Round time up:

☐

Confirm

Reset

Figure 63: Internal communication settings

Table 42: IEC104 Device communication settings

Setting	Format	Range	Default	Description
Baud rate of device serial	Bd	1200-115200	115200	Baud rate of device serial port
ON time of serial LEDs	10 ms	1 to 100	2	ON time of serial LEDs
Timeout for recep-	10 ms	1 to 255	50	Timeout for reception of first character

Setting	Format	Range	Default	Description
tion of first char				
Inter character timeout	10 ms	1 to 255	20	Timeout between two characters in telegram
Number of repeats for SYNC cycle	-	1 to 255	10	Number of repeats for SYNC cycle
Number of command repeats	-	1 to 255	3	Number of command (poll) repeats
TX blocking	ms	0 to 255	0	Time to wait when answer was received
Timeout for analog cyclic sending	s	0 to 650	0	Timeout for analog (measurements) cyclic sending (0 = disable)
Time to stop reg. interrogation	s	0 to 650	0	Time to stop regulator interrogation after IEC communication break
Round time down / up	-	option box	round down	Rounding time selection

### 13.3.3 IEC104 Commands

The IEC104 commands table contains commands and also data points transmitted in the direction toward to the REG-PE(D) board.

Commands

Columns to hide

Common address of ASDU Information object address (IOA) IOA (hi/ni/lo) Control code Command string Scale exponent 100% value Description

Confirm

Reset

Add

Insert

Delete

Export

Import

Search:

Rows count: 19 Count of selected rows: 0

Common address of ASDU	Information object address (IOA)	IOA (hi/ni/lo)	Control code	Command string	Scale exponent	100% value	Description
1	8200	0 / 32 / 8	T145/T159	RegAUTO=	direct command without space(1/0)	0	Hand/Auto
1	8193	0 / 32 / 1	T147/T160	.aa.q20=if.regup=1,else.regdown=	direct command without space(1/0)	0	Regler A Ho
1	8194	0 / 32 / 2	T145/T158	RegSWI+1,	direct command without space(1/0)	0	Regler A So
1	8195	0 / 32 / 3	T145/T158	RegSWI+2,	direct inverted command without space(1/2)	0	Regler A So
1	8196	0 / 32 / 4	T145/T158	RegSWI+3,	direct command without space(1/0)	0	Regler A So
1	8197	0 / 32 / 5	T145/T158	RegSWI+4,	direct command without space(1/0)	0	Regler A So
1	8198	0 / 32 / 6	T145/T158	1, REGsw1-,-REGsw1=,,	direct command without space(1/0)	0	Regler A So
1	8199	0 / 32 / 7	T145/T158	-1, REGsw1-,-REGsw1=,,	direct command without space(1/0)	0	Regler A So
1	8201	0 / 32 / 9	T145/T158	1, REGsw2-,-REGsw2=,,	direct command without space(1/0)	0	Regler A So
1	8202	0 / 32 / 10	T145/T158	-1, REGsw2-,-REGsw2=,,	direct command without space(1/0)	0	Regler A So

Figure 64: IEC104 commands

Table 43: IEC104 commands

Setting	Format	Range	Default	Description
Common address of ASDU	-	0 to 65534	1	ASDU address of remote station authorized for connection with telecontrol board
Information object address (IOA)	-	0 to 16777215 or 3x 0 to 255	0	IOA of the corresponding data point
Control code		Selection of values	T145/TI5 8	Type of information object

Setting	Format	Range	Default	Description
		in listbox		
Command string	text	50 characters		Command string
Scale exponent	-	Selection of values in listbox	1/0	Addition command parameter according to the available list
100% value	-	0 to 65535	0	100% value, available for TI48 only
Description	text	50 characters		User description

13.3.4 IEC104 indications

Indications

Columns to hide

Description

IEC object type

RegSys type

Information object address (IOA)

IOA (hi/mi/lo)

Abs. deviation

Scale

Max. value

RPS of

Confirm

Reset

Add

Insert

Delete

Export

Import

Advanced

Search:

Row count: 81 Count of selected rows: 0

<input type="checkbox"/>	Description	IEC object type	RegSys type	Information object address (IOA)	IOA (hi/mi/lo)	Abs. deviation	Scale
<input type="checkbox"/>		---	---				
<input type="checkbox"/>	Spannung, voltage	TI13	Float	8193	0 / 32 / 1	0	1
<input type="checkbox"/>	Master, master activ(a20)	TI30	Bit	8194	0 / 32 / 2	0	1
<input type="checkbox"/>	Slave, regulator is slave	TI30	Bit	8195	0 / 32 / 3	0	1
<input type="checkbox"/>	zul. Regelabweichung, tolerance band setting	TI13	Float	8197	0 / 32 / 5	0	1

Figure 65: IEC104 indications

Table 44: IEC104 indications

Setting	Format	Range	Default	Description
Description	text	50 chars	empty	Description
IEC object type	-	selection of values in list box	TI1	Indication type in IEC communication
RegSys type	-	selection of values in list box	Bit	Indication type in device communication
Information object address (IOA) (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	IEC address (IOA) of indication
Abs. deviation	float		0	Absolute deviation value
Scale	float		0	Scale value
Max. value	-	0 to 65535	32767	Max. value



Setting	Format	Range	Default	Description
RPS offset	-	0 to 255	0	RPS offset
RPS bit	-	selection of values in list box	0	RPS bit
Use in GI	-	selection of values in list box	Yes	Usage of indication in General Interrogation
Gr. 0	-	selection of values in list box	Yes	Group 0 in general interrogation
Gr. 1	-	selection of values in list box	No	Group 1 in general interrogation
Gr. 2	-	selection of values in list box	No	Group 2 in general interrogation
Gr. 3	-	selection of values in list box	No	Group 3 in general interrogation
Gr. 4	-	selection of values in list box	No	Group 4 in general interrogation

The available types of information objects are stated in the following list:

- TI30: Single-point information with time tag
- TI31: Double-point information with time tag
- TI9/TI34: Measured value, normalized value/ Measured value, normalized value with time tag
- TI13/TI36: Measured value, short floating point value/ Measured value, short floating point value with time tag
- TI45/TI58: Single command/ Single command with time tag
- TI46/TI59: Double command/ Double command with time tag
- TI47/TI60: Regulating step command/ Regulating step command with time tag
- TI48/TI61: Set point command, normalized value/ Set point command, normalized value with time tag
- TI49/TI62: Set point command, scaled value/ Set point command, scaled value with time tag
- TI50/TI63: Set point command, short floating point value/ Set point command, short floating point value with time tag

## 14. DNP3 settings (REG-P)

Chapter DNP settings describes only settings not described above.

### 14.1 Basic

Basic settings branch tree contains basic settings for DNP protocol conversion.

Basic

Settings description:

DNP3 settings

Baud rate of serial port DNP3 [Bd]:  
Link address of REG-P:  
Link address of DNP3 master:  
DNP3 RS485 activated:  
DNP3 fiber optics activated:  
DNP3 RS232 used:  
*Idle mode of fiber optics is switched by accordant setting.*

9600

▼

103

1

☐

☐

☒

Device

Identifier of device

1

AA:

Confirm

Reset

Migrate to TK517

Figure 66: DNP3 basic settings REG-P

Table 45: DNP3 basic settings REG-P

Setting	Format	Range	Default	Description
Settings description	text	50 characters	Filename of open settings	Short user description of settings file or name of settings file.
Baud rate of serial port DNP3	Bd	selection of values in combo box	9600	Baud rate of serial port DNP
Link address of REG-P	-	0 to 65535	103	Link address of REG-P
Link address of DNP3 master	-	0 to 65535	1	Link address of DNP master
DNP3 RS485 activated	-	option box	not selected	DNP3 RS485 activated
DNP3 fiber optics activated	-	option box	not selected	DNP3 fiber optics activated

DNP3 settings (REG-P)

Page 131

Setting	Format	Range	Default	Description
DNP3 RS232 used	-	option box	selected	DNP3 RS232 used
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device

## 14.2 Advanced

### 14.2.1 Settings - SCADA

Advanced tree branch for Settings - SCADA contains complete DNP3 specific communication settings.

DNP3

Interface settings

DNP3 receiver inverted:

☐

DNP3 transmitter inverted:

☐

DNP3 RS485 activated:

☐

DNP3 fiber optics activated:

☐

DNP3 RS232 used:

☒

Baud rate of serial port DNP3 [Bd]:

9600

ON time of serial LEDs [10ms]:

1

Protocol settings

Link address of REG-P:

103

Link address of DNP3 master:

1

Inter character timeout [Fosc/12]:

18000

Timeout after interchar [ms]:

10

Time till reset [10ms]:

100

Number of TSDU fragments:

1

Size of each TSDU fragment [byte]:

249

Using confirmation for EVENT response:

☐

Timeout for receiving AL confirmation [10ms]:

80

Number of repetitions after AL confirm timeout:

1

Timeout select/operate function [10ms]:

500

Event queue size:

256

Confirm

Reset

Figure 67: Advanced Settings - SCADA for REG-P (TK509, TK400)

Table 46: DNP3 Settings - SCADA REG-P (TK509, TK400)

Setting	Format	Range	Default	Description
DNP3 receiver inverted	-	checkbox	unchecked	DNP3 receiver inverted without jumpers
DNP3 transmitter inverted	-	checkbox	unchecked	DNP3 transmitter inverted
DNP3 RS485 terminator activated	-	checkbox	unchecked	DNP3 RS485 terminator activated
DNP3 RS485 activated	-	radio button	unchecked	DNP3 RS485 activated
DNP3 fiber optics activated	-	radio button	unchecked	DNP3 fiber optics activated
DNP3 RS232 used	-	radio button	checked	DNP3 RS232 used
Baud rate of serial port DNP3	Bd	selection of values in combo box	9600	Baud rate of serial port DNP
ON time of serial LEDs	10 ms	1 to 255	4	ON time of serial LEDs
Link address of REG-P	-	0 to 65535	103	Link address of REG-P
Link address of DNP3 master	-	0 to 65535	1	Link address of DNP master
Inter character timeout	Fosc/12	1000 to 65535	18000	Timeout between two characters in telegram
Timeout after inter character	ms	0 to 255	0	Timeout after inter character timeout expiration
Time till reset	10 ms	1 to 65535	100	Time until reset after cold restart
Number of TSDU fragments	-	1 to 128	1	Number of TSDU fragments
Size of each TSDU fragment	-	249 - 2048	249	Size of each TSDU fragment
Using confirmation for EVENT response	-	checkbox	unchecked	Using confirmation for EVENT response
Timeout for receiving AL confirmation	10 ms	1 to 65535	80	Timeout for receiving AL confirmation
Number of repetitions after AL confirm timeout		0 to 255	1	Number repetitions after AL confirm timeout
Timeout select/operate function	10 ms	1 to 65535	500	Timeout select/operate function
Event queue size	-	10 to 1024	256	Event queue size

DNP3

Interface settings

Telecontrol board designation:

TK517/FL4

DNP3 receiver inverted:

☐

DNP3 transmitter inverted:

☐

DNP3 RS485 terminator activated:

☐

DNP3 RS485 activated:

☐

DNP3 fiber optics activated:

☐

DNP3 RS232 used:

☒

Baud rate of serial port DNP3 [Bd]:

9600

ON time of serial LEDs [10ms]:

1

Protocol settings

Link address of REG-P:

103

Link address of DNP3 master:

1

Inter character timeout [Fosc/12]:

18000

Timeout after interchar [ms]:

10

Time till reset [10ms]:

100

Number of TSDU fragments:

1

Size of each TSDU fragment [byte]:

249

Using confirmation for EVENT response:

☐

Timeout for receiving AL confirmation [10ms]:

80

Number of repetitions after AL confirm timeout:

1

Timeout select/operate function [10ms]:

500

Event queue size:

256

Confirm

Reset

Figure 68: Advanced Settings - SCADA for REG-P (TK517)

Table 47: DNP3 Settings - SCADA REG-P (TK517)

Setting	Format	Range	Default	Description
Telecontrol board designation		selection of values in combo box	TK517/FL4	Selection from 4 available board types to get correct version of firmware.
DNP3 receiver inverted	-	checkbox	unchecked	DNP3 receiver inverted, option for board without jumpers
DNP3 transmitter inverted	-	checkbox	unchecked	DNP3 transmitter inverted, option for board without jumpers
DNP3 RS485 terminator activated	-	checkbox	unchecked	DNP3 RS485 terminator activated, option for board without jumpers
DNP3 RS485 activated	-	radio button	unchecked	DNP3 RS485 activated, option for board without jumpers
DNP3 fiber optics activated	-	radio button	unchecked	DNP3 fiber optics activated, option for board without jumpers
DNP3 RS232 used	-	radio button	checked	DNP3 RS232 used, option for board without jumpers
Baud rate of serial port DNP3	Bd	selection of values in combo box	9600	Baud rate of serial port DNP
ON time of serial LEDs	10 ms	1 to 255	4	ON time of serial LEDs
Link address of REG-P	-	0 to 65535	103	Link address of REG-P
Link address of DNP3 master	-	0 to 65535	1	Link address of DNP master
Inter character timeout	Fosc/12	1000 to 65535	18000	Timeout between two characters in telegram
Timeout after interchar	ms	0 to 255	0	Timeout after inter character timeout expiration
Time till reset	10 ms	1 to 65535	100	Time until reset after cold restart
Number of TSDU fragments	-	1 to 128	1	Number of TSDU fragments
Size of each TSDU fragment	-	249 - 2048	249	Size of each TSDU fragment
Using confirmation for EVENT response	-	option box	Not selected	Using confirmation for EVENT response
Timeout for receiving AL confirmation	10 ms	1 to 65535	80	Timeout for receiving AL confirmation
Number of repetitions after AL confirm timeout		0 to 255	1	Number repetitions after AL confirm timeout

Setting	Format	Range	Default	Description
Timeout select/operate function	10 ms	1 to 65535	500	Timeout select/operate function
Event queue size	-	10 to 1024	256	Event queue size

### 14.3 Device x

#### 14.3.1 Device request settings

Device request settings tree branch contains device specific settings.

**Device Request Settings**

Identifier of device:

AA:

Poll type:

RPS

Poll string:

RPS 3

Size of answer [byte]:

244

Offset of seconds field [byte]:

18

Offset of msec field [byte]:

22

Confirm

Reset

Figure 69: DNP3 device request settings REG-P

Table 48: DNP3 device settings REG-P

Setting	Format	Range	Default	Description
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device as appears in the device communication
Poll type	-	selection of values in combo box	RPS	Device poll type
Poll string	text	23 chars	RPS 3	Device poll string
RPS specific: Size of answer	byte	1 to 255	244	Size of answer
RPS specific: Offset of seconds field	byte	0 to 255	18	Offset of seconds field
RPS specific: Offset of msec field	byte	0 to 255	22	Offset of msec field



14.3.2 Commands

Commands tree branch contains DNP specific settings for DNP protocol.

Commands

Columns to hide

Output typeDNP3 obj. indexControl codeScaleCommand stringDescription

ConfirmResetAddInsertDeleteExportImport

Search: Rows count:26 Count of selected rows:0

	Output type	DNP3 obj. index	Control code	Scale	Command string	Description
	---		---	---		
<input type="checkbox"/>	Relay	1	Trip/Close	1	REGAUTO =	Auto/Manual
<input type="checkbox"/>	Relay	2	Operate on object	1	REGhoesher = 1	Raise Tap
<input type="checkbox"/>	Relay	3	Operate on object	1	REGtiefer = 1	Lower Tap

Figure 70: DNP3 commands REG-P

Table 49: DNP3 commands REG-P

Setting	Format	Range	Default	Description
Output type	-	selection of values in combo box	Relay	Output type
Obj. index	-	0 to 128	0	
Control code	-	selection of values in combo box	Operate on object	Control code
Scale	-	selection of values in combo box	1	Scale, valid for analog data type
Command string	text	50 characters	empty	Command string
Description	text	50 characters	empty	User description



The function for storage of descriptions of commands and data points in the telecontrol board memory is not implemented for DNP3 protocol.

Settings transferred back to PC from REG-P telecontrol board will have empty descriptions of commands and data points.

14.3.3 Indications

Indications tree branch contains DNP specific settings for DNP protocol.

Indications

Columns to hide

Description

DNP3 object type

RegSys type

DNP3 obj. index

Static definitions

Event definitions

Event class

Abs. deviation

Scale

Confirm

Reset

Add

Insert

Delete

Export

Import

Advanced

Search:

Row count:105 Count of selected rows:0

<input type="checkbox"/>	Description	DNP3 object type	RegSys type	DNP3 obj. index	Static definitions	Event definitions
<input type="checkbox"/>		---	---		---	---
<input type="checkbox"/>	Status of Device 1: OK	Binary input	Bit	1	1/2 with status	2/2 with time
<input type="checkbox"/>	Log Overflow	Binary input	Bit	2	1/2 with status	2/2 with time
<input type="checkbox"/>	Parallel Processing Error	Binary input	Bit	3	1/2 with status	2/2 with time
<input type="checkbox"/>	ELAN Comms Error (1: Error)	Binary input	Bit	4	1/2 with status	2/2 with time
<input type="checkbox"/>	Tap Position Error (1: Error)	Binary input	Bit	5	1/2 with status	2/2 with time
<input type="checkbox"/>	Manual/Auto (1: Auto)	Binary input	Bit	6	1/2 with status	2/2 with time
<input type="checkbox"/>	Single/Parallel (1: Parallel)	Binary input	Bit	7	1/2 with status	2/2 with time
<input type="checkbox"/>	Local/Remote (1: Remote)	Binary input	Bit	8	1/2 with status	2/2 with time

Figure 71: DNP3 indications REG-P

Table 50: DNP3 indications REG-P

Setting	Format	Range	Default	Description
DNP3 object type	-	selection of values in combo box	Binary input	DNP object type
REG data type	-	selection of values in combo box	Bit	REG data type
DNP3 obj. index	-	0 to 65535	0	DNP object index
Static definitions	-	selection of values in combo box	no class 0 point	Static definitions
Event definitions	-	selection of values in combo box	no event	Event definitions
Event class	-	selection of values in combo box	1	Event class
Abs. deviation	-	0 to 65535	0	Absolute deviation
Scale	float		1	Scale
RPS offset		0 to 255	0	RPS offset
RPS bit	-	selection of values in combo box	0	RPS bit
Description	text	50 characters	empty	User description

# 15. DNP3 settings (REG-PE(D))

## 15.1 Basic

Basic

Settings description: DNP3\_REGD\_BASIC

Line type: serial

Baud rate of serial port DNP3 [Bd]: 19200

Link address of REG-PE(D): 103

Link address of DNP3 master: 1

RS485 activated: ☐

Device	Identifier of device
1	AA:

Confirm

Reset

Figure 72: DNP3 basic settings REG-PE(D)

Table 51: DNP3 basic settings REG-PE(D)

Setting	Format	Range	Default	Description
Settings descrip- tion	text	50 characters	Identification if the tem- plate source	Short user description of settings file.
Line type	-	selection of values in com- bo box	serial	Type of communication line – serial, Ethernet TCP, Ethernet UDP
Authorized cen- tral stations IP addresses	-	4x 0 to 255	192.168.1.68 192.168.1.64 192.168.1.43	IP addresses of central sta- tions authorized to connect to telecontrol board
Baud rate of serial port DNP3	Bd	selection of values in com- bo box	19200	Baud rate of serial port DNP
Link address of REG-P	-	0 to 65535	103	Link address of REG-P
Link address of DNP3 master	-	0 to 65535	1	Link address of DNP master
RS485 activated	-	option box	not selected	RS485 activated
Identifier of de- vice	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device

## 15.2 Advanced

### 15.2.1 Settings SCADA

The advanced tree branch SCADA setting contains complete DNP3 specific communication settings.

DNP3

Interface settings

Line type:

serial

Serial port:

COM1

Baud rate of serial port DNP3 [Bd]:

19200

Parity:

OFF

ON time of serial LEDs [ms]:

4

RS485 activated:

☐

Protocol settings

Link address of REG-PE(D):

103

Link address of DNP3 master:

1

Inter character timeout [ms]:

4

Time till reset [ms]:

1000

Number of TSDU fragments:

1

Size of each TSDU fragment [byte]:

2048

Using confirmation for EVENT response:

☒

Timeout for receiving AL confirmation [ms]:

800

Number of repetitions after AL confirm timeout:

1

Timeout select/operate function [ms]:

5000

Mode of watchdog LED:

blinking

Confirm

Reset

Figure 73: Advanced settings SCADA REG-PE(D)

Table 52: DNP3 advanced settings REG-PE(D)

Setting	Format	Range	Default	Description
Line type	-	selection of values in combo box	serial	Type of communication line – serial, Ethernet TCP, Ethernet UDP
Authorized central stations IP addresses	-	4x 0 to 255	192.168.1.68 192.168.1.64 192.168.1.43	IP addresses of central stations authorized to connect to tele-control board
Port	-	1 to 65535	20000	TCP or UDP Port
Serial port	-	selection of values in combo box	COM1	Selection of DNP3 COM port
Baud rate of serial port DNP3	Bd	selection of values in combo box	19200	Baud rate of serial port DNP
Parity	-	selection of values in combo box	Off	Parity of serial port DNP
ON time of serial LEDs	ms	0 to 255	4	ON time of serial LEDs
Link address of REG-PE(D)	-	0 to 65535	103	Link address of REG-P
Link address of DNP3 master	-	0 to 65535	1	Link address of DNP master
Inter character timeout	ms	2 to 1000	4	Timeout between two characters in telegram
Time till reset	ms	1 to 65535	1000	Time until reset after cold restart
RS485 activated	-	option box	Not selected	RS485 activated
Number of TSDU fragments	-	1 to 128	1	Number of TSDU fragments
Size of each TSDU fragment	-	64 - 2048	2048	Size of each TSDU fragment
Using confirmation for EVENT response	-	option box	selected	Using confirmation for EVENT response
Timeout for receiving AL confirmation	ms	1 to 65535	800	Timeout for receiving AL confirmation
Number of repetitions after AL confirm timeout	-	0 to 255	1	Number repetitions after AL confirm timeout
Timeout select/operate function	ms	1 to 65535	5000	Timeout select/operate function

## 15.3 Device X

### 15.3.1 Device request settings

Device request settings tree branch contains device specific settings.

Device Request Settings

Identifier of device:

AA:

Poll string:

RPS 3

Size of answer [byte]:

244

Offset of seconds field [byte]:

18

Offset of msec field [byte]:

22

Description:

Confirm

Reset

Figure 74: DNP3 device request settings REG-PE(D)

Table 53: DNP3 device settings REG-PE(D)

Setting	Format	Range	Default	Description
Identifier of de-vice	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device as appears in the device communication
Poll string	text	23 chars	fread RPS 3	Device poll string
Size of answer	byte	1 to 255	244	Size of answer
Offset of seconds field	byte	0 to 255	18	Offset of seconds field
Offset of msec field	byte	0 to 255	22	Offset of msec field
Description	string	30 characters	Empty string	User description

### 15.3.2 Indications

Indications

Columns to hide

Description

DNP3 object type

RegSys type

DNP3 obj. index

Static definitions

Event definitions

Event class

Abs. deviation

Scale

Confirm

Reset

Add

Insert

Delete

Export

Import

Advanced

Search:

Row count:105 Count of selected rows:0

<input type="checkbox"/>	Description	DNP3 object type	RegSys type	DNP3 obj. index	Static definitions	Event definitions
<input type="checkbox"/>		---	---		---	---
<input type="checkbox"/>	Status of Device 1: OK	Binary input	Bit	1	1/2 with status	2/2 with time
<input type="checkbox"/>	Log Overflow	Binary input	Bit	2	1/2 with status	2/2 with time
<input type="checkbox"/>	Parallel Processing Error	Binary input	Bit	3	1/2 with status	2/2 with time
<input type="checkbox"/>	ELAN Comms Error (1: Error)	Binary input	Bit	4	1/2 with status	2/2 with time
<input type="checkbox"/>	Tap Position Error (1: Error)	Binary input	Bit	5	1/2 with status	2/2 with time
<input type="checkbox"/>	Manual/Auto (1: Auto)	Binary input	Bit	6	1/2 with status	2/2 with time
<input type="checkbox"/>	Single/Parallel (1: Parallel)	Binary input	Bit	7	1/2 with status	2/2 with time
<input type="checkbox"/>	Local/Remote (1: Remote)	Binary input	Bit	8	1/2 with status	2/2 with time
<input type="checkbox"/>	Master/Not Master (1: Master)	Binary input	Bit	9	1/2 with status	2/2 with time

Figure 75: DNP3 indications REG-PE(D)

Table 54: DNP3 indications REG-PE(D)

Setting	Format	Range	Default	Description
DNP3 object type	-	selection of values in combo box	Binary input	DNP3 object type
REG data type	-	selection of values in combo box	Bit	REG data type
DNP3 obj. index	-	0 to 65535	0	DNP object index
Static definitions	-	selection of values in combo box	no class 0 point	Static definitions
Event definitions	-	selection of values in combo box	no events	Event definitions
Event class	-	selection of values in combo box	1	Event class
Abs. deviation	float		0	Absolute deviation
Scale	float		1	Scale
RPS offset		0 to 255	0	RPS offset
RPS bit	-	selection of values in combo box	0	RPS bit
Description	text	50 characters	empty	User description
Simulation		selection of values in combo box	No	Option whether the data point value can be simulated
Simulation value		according to the data	0	Simulated data point val-

Setting	Format	Range	Default	Description
		type		ue

Simulation of the data point value is new feature in WinConfig v.11.0.6. User can allow simulation and prepare simulation values of individual data points. The simulation can be consequently launched by *Run simulation* button in the online WinConfig in REG-PE(D) tele-control board.



15.3.3 Commands

Commands

Columns to hide

Output typeObj. indexControl codeScaleCommand stringDescription

ConfirmResetAddInsertDeleteExportImport

Search: Rows count:26 Count of selected rows:0

<input type="checkbox"/>	Output type	Obj. index	Control code	Scale	Command string	Description
<input type="checkbox"/>	---		---	---		
<input type="checkbox"/>	Relay	1	Trip/Close	1	REGAUTO =	Auto/Manual
<input type="checkbox"/>	Relay	2	Operate on object	1	REGhoeher = 1	Raise Tap
<input type="checkbox"/>	Relay	3	Operate on object	1	REGtiefer = 1	Lower Tap

Figure 76: DNP3 commands REG-PE(D)

Table 55: DNP3 commands REG-PE(D)

Setting	Format	Range	Default	Description
Output type	-	selection of values in combo box	Relay	Output type
Obj. index	-	0 to 255	1	Object index
Control code	-	selection of values in combo box	Operate on object	Control code
Scale	-	selection of values in combo box	1	Scale, valid for analog data type
Command string	text	50 characters	empty	Command string
Description	text	50 characters	empty	User description

## 16. CSO settings (REG-P)

CSO settings are used for COM-Server Only firmware type. Only one tree branch with setting is available. Changes of Communication settings of REG-P are recommended for advanced user only.

CSO

Settings description: CSO\_XXX\_TK400

REG-P TCP/IP settings

Local (REG-P) IP address:

192.168.56.90

Gateway IP address:

192.168.1.43

Subnet mask:

255.255.0.0

Accept any valid client IP:

☒

Refuse second connection:

☒

Authorized central stations IP addresses:

0.0.0.0

0.0.0.0

0.0.0.0

0.0.0.0

0.0.0.0

0.0.0.0

TCP port (data transfer):

1023

UDP port (remote parameterization):

12000

Device communication settings

Baud rate of serial port [Bd]:

115200

Timeout of device responses [10ms]:

200

Inter character timeout [ms]:

70

TX blocking [ms]:

0

Confirm

Reset

Defaults

Enable

Figure 77: CSO settings REG-P

Table 56: CSO settings REG-P

Setting	Format	Range	Default	Description
Settings description	text	50 characters	Filename of open settings	Short user description of settings file or name of settings file.
Local (REG-P) IP address	-	4x 0 to 255	192.168.56.90	Local (REG-P) IP address
Gateway IP address	-	4x 0 to 255	192.168.1.43	IP address of default gateway
Subnet mask	-	4x 0 to 255	255.255.0.0	Subnet mask
Accept any valid client IP	-	checkbox	checked	Accept any valid client IP
Refuse second connection	-	checkbox	checked	Refuse second connection if other connection is already set. Otherwise the current connection is closed and the new one established.
Authorized central stations IP addresses	-	4x 0 to 255	0.0.0.0	IP address of authorized central stations, 6 available addresses
TCP port (data transfer)	-	1 to 65535	1023	TCP port for data transfer. Changing of this value is not recommended.
UDP port (remote parameterization)	-	1 to 65535	12000	UDP port for remote parameterization. Changing of this value is not recommended.
Baud rate of device serial	Bd	selection of values in combo box	115200	Baud rate of device serial communication. Device settings are accessible after clicking the Enable button. Experienced staff should do changing of device settings only.
Timeout of REG-P responses	10ms	1 to 255	200	Timeout of REG-P responses
Inter character timeout	ms	1 to 255	70	Timeout between two characters in device communication
Time to wait after REG-P response	ms	0 to 255	0	Timeout after message reception

## 17. CSO settings (REG-PE(D))

### 17.1 CSO channels

COM-Server

Confirm

Reset

Add

Insert

Delete

Extend

Rows count: 4

Enter Password to Extend:

<input type="checkbox"/> Activate:	Connection type	IP address	TCP port	Inactivity timeout [s]	Serial port	Baud rate	Parity	XON/XOFF	RTS/CTS
<input type="checkbox"/> Yes	Socket	0.0.0.0	5001	0	COM1	115200	None	Yes	No
<input type="checkbox"/> Yes	Socket	0.0.0.0	5002	0	COM2	115200	None	Yes	No
<input type="checkbox"/> Yes	Socket	0.0.0.0	5003	0	COM3	115200	None	Yes	No
<input type="checkbox"/> Yes	Socket	0.0.0.0	5006	0	COM2	115200	None	No	Yes

Figure 78: CSO channels REG-PE(D)

Table 57: CSO settings REG-PE(D) - Channels

Setting	Format	Range	Default	Description
Disabled	-	Yes/No	No	Option to disable the channel
State	-	Selection of values in combo box	RAW	State of channel. OFF disables the port from accepting connections. It can be turned on later. RAW enables the port and transfers all data as-is between the port and the device. RAWLP enables the port and transfers all input data to device; device is open without any POSIX setting or directly. TELNET enables the port and runs the telnet protocol on the port to set up telnet settings. This is most useful for using telnet. USD enables the shared port and transfers all data as-is between port and the device vie shared serial. USD mode used for global-resource sharing from Network and IEC control center
IP address	-	4x 0 to 255	0.0.0.0	IP address
TCP port	-	0 to 65535	3003	TCP port
Inactivity timeout	s		180	Inactivity timeout
Serial port	-	Selection of values in combo box	COM2	Selection of serial port
Baud rate	Bd	Selection of values in combo box	115200	Baud rate

Setting	Format	Range	Default	Description
Parity	-	Selection of values in combo box	Even	Parity
Stop bits	-	Selection of values in combo box	1	Stop bits
Data bits	-	Selection of values in combo box	8	Data bits
XON/XOFF	-	Selection of values in combo box	No	Option to select XON/XOFF handshaking
RTS/CTS	-	Selection of values in combo box	No	Option to select RTS/CTS handshaking
RTS inverted	-	Selection of values in combo box	No	Option to select inversion of RTS signal
TxD inverted	-	Selection of values in combo box	No	Option to select inversion of TxD signal
Interface type	-	Selection of values in combo box	RS232	Selection of interface type

## 17.2 CSO Supervisory settings

The *Supervisory settings* tree branch can be used for activation and configuration of debug logs.

Supervisory

COM-Server Trace

Activate trace

☐

Level:

User

Trace via PARAM-Connector (limited capacity due to RS232-bottleneck):

☒

Trace via TCP-Port (recommended):

☐

TCP port

5010

Logging with Timestamp (Performance reduction!):

☐

COM-Server Tx-Rx Mirroring

Activate trace

☐

TCP-port:

5011

Confirm

Reset

Figure 79: CSO channels REG-PE(D)

Table 58: CSO Supervisory settings

Setting	Format	Range	Default	Description
Activate		checkbox	checked	Protocol debug option activation
Level	-	Selection of values in combo box	user	Option to select lever of supervisory messages (user, developer)
Verbose Output	-	checkbox	unchecked	Verbose Output
Trace via PARAM-Connector)	-	radio button	checked	Logging to PARAM-Connector
Trace via TCP-Port	-	radio button	unchecked	Logging to TCP port
TCP port	-	1 to 65535	55555	TCP port
Logging with Timestamp	-	checkbox	checked	Logging with Timestamp
Mirror port: Activate trace	-	checkbox	checked	Mirror port: Activate
TCP-port	-	1 to 65535	55444	TCP port

## 18. Modbus settings

You are able to select of either two connection type “serial” or “TCP”.

### 18.1 Basic settings MODBUS RTU

Basic settings tree branch form contains common settings of MODBUS protocol – selection of available Baud rates, Slave address and identifier if device (devices). Basic settings also contain use definable description - name of the entire settings.

Basic

Settings description:

Line type: 

serial

Baud rate of serial port MODBUS [Bd]: 

19200

Slave Address/Unit ID: 

2

RS485 activated: ☐

Device	Identifier of device
1	<div>AA:</div>

Confirm

Reset

Figure 80: MODBUS RTU basic settings

Table 59: MODBUS basic settings

Setting	Format	Range	Default	Description
Settings de- scription	Text	50 characters	Filename of open settings	Short user description of settings file or name of set- tings file.
Slave address	-	1-247	2	Address of slave
RS485 acti- vated	Bd	Checkbox	unchecked	If unchecked then RS232 or fiber optic mode is selected.
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	defaults defined in the Devices tree branch	Device identifier string as appears in the device proto- col

## 18.2 Basic settings MODBUS TCP

Basic settings tree branch form contains common settings of MODBUS TCP protocol – selection of Unit ID and identifier if device (devices). Basic settings also contain user definable description - name of the entire settings.

Basic

Settings description:

Line type:

Ethernet - TCP

Slave Address/Unit ID:

Device

Identifier of device

1

AA:

Confirm

Reset

Figure 81: Modbus TCP basic settings

Table 60: MODBUS TCP basic settings

Setting	Format	Range	Default	Description
Settings de- scription	Text	50 characters	Filename of open settings	Short user description of settings file or name of set- tings file.
Unit Id	-	1-247	2	Slave Address (same as the Unit ID used in MODBUS TCP/IP).
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	defaults defined in the Devices tree branch	Device identifier string as appears in the device proto- col

The port number is default 502.



### 18.3 Advanced - Settings - SCADA

*Advanced settings* tree branch contains the complete range of MODBUS settings:

MODBUS

Interface settings

Serial port:

COM1

Baud rate of serial port MODBUS [Bd]:

19200

Parity:

EVEN

ON time of serial LEDs [ms]:

20

RS485 activated:

☐

RTS/CTS:

☐

XON/XOFF:

☐

Protocol settings

Slave address:

2

Response timeout [ms]:

5

Turnaround delay [ms]:

250

No reply:

0

Mode of watchdog LED:

blinking

Confirm

Reset

Figure 82: MODBUS SCADA settings

Table 61: MODBUS advanced settings

Setting	Format	Range	Default	Description
Serial port	-	Selection of values in combo box	COM1	Selection of available COM ports for Modbus communication
Baud rate of serial [Bd]	Bd	Selection of values in combo box	19200	Baud rate of Modbus serial port
Parity	-	Selection of values in combo box	Even	Parity of Modbus serial port
ON time of serial LEDs	ms	0 to 65535	20	ON time of serial LEDs indicating activity on the Modbus serial interface
Slave address	-	1-247	2	Address of slave
RS 485 activated	-	checkbox	Not checked	Activation of RS485 interface
<b>RTS/CTS</b>	-	<b>checkbox</b>	<b>Not checked</b>	<b>RTS/CTS handshaking</b>
XON/XOFF	-	checkbox	Not checked	XON/XOFF handshaking
<b>Response timeout</b>	<b>ms</b>	<b>2 to 100</b>	<b>5</b>	<b>SCADA response timeout</b>
Turnaround delay	ms	0 to 65535	250	Turnaround delay
No reply	-	0 to 255	0	No reply
Mode of watchdog LED	-	Selection of values in combo box	blinking	Mode of watchdog LED (blinking/switched off)

## 18.4 Devices

*Devices* tree branch is the same as for IEC101 protocol. See chapter 9.2.

### 18.4.1 Time synchronization

*Time synchronization* tree branch is the same as for IEC104 protocol. See chapter 11.2.2.

### 18.4.2 Internal communication settings

Device communication settings contain the following options:

Internal communication

Baud rate of device serial port [Bd]:

115200

Parity:

EVEN

ON time of serial LEDs [ms]:

10

Timeout for reception of first char [ms]:

80

Inter character timeout [ms]:

100

TX blocking [ms]:

30

Number of repeats for SYNC cycle:

3

Number of poll repeats:

1

Round time down:

Round time up:

Use UTC for time synchronization:

Confirm

Reset

Figure 83: Device internal communication settings

Table 62: Device communication settings for MODBUS

Setting	Format	Range	Default	Description
Baud rate of device serial	Bd	Selection of values in combo box	115200	Baud rate of device serial port
Parity	-	Selection of values in combo box	Even	Parity of device serial port
ON time of serial LEDs	ms	0 to 65535	10	ON time of serial LEDs for indication of device communication
Timeout for reception of first char	ms	0 to 65535	90	Timeout for reception of first character
Inter character timeout	ms	0 to 65535	80	Timeout between two characters in telegram
TX blocking	ms	0 to 65535	30	Timeout to wait when answer was received
Number of repeats for SYNC cycle	-	0 to 255	3	Number of repeats for SYNC cycle
Number of command repeats	-	0 to 255	1	Number of command (poll) repeats
Round time down / Round time up	-	option box	round down	Rounding time selection
Use UTC for time synchronization	-	check box	unchecked	Selection of usage UTC for time synchronization

## 18.5 Device x

### 18.5.1 Device settings

Device Request Settings

Identifier of device:

AA:

Poll string:

RPS 4

Type of seconds field:

INT32U

Offset of seconds field [byte]:

18

Type of msec field:

INT16U

Offset of msec field [byte]:

22

Description:

Confirm

Reset

Figure 84: MODBUS device request settings

Table 63: MODBUS device settings

Setting	Format	Range	Default	Description
Identifier of de-vice	text	3 chars	AA:	Identifier of device as appears in the device communication
Poll string	text	63 chars	RPS 4	Device poll string
Type of seconds field	-	Selection of values in combo box	INT32U	Type of “seconds” field
Offset of seconds field	byte	0 - 65535	18	Offset of seconds field
Type of msec field	-	Selection of values in combo box	INT32U	Type of “milliseconds” field
Offset of msec field	byte	0 - 65535	22	Offset of “milliseconds” field
Description	text	30 chars	empty	User description

18.5.2 Indications

Indications tree branch describes indications of individual device.

Indications

Columns to hide

Description

Data Model

Address

Bit in register

Device offset

RegSys type

RPS bit

Deviation

Confirm

Reset

Add

Insert

Delete

Export

Import

Advanced

Search:

Row count:348 Count of selected rows:0

<input type="checkbox"/>	Description	Data Model	Address	Bit in register	Device offset	Reg Sys type	RPS bit	Devia
<input type="checkbox"/>		---		---		---	---	
<input type="checkbox"/>	1:Status OK, 0:device not ok	Discrete Inputs	8300	0	3	BIT/BYTE	0	0
<input type="checkbox"/>	1:Buffer Overrun, 0:noOverrun	Discrete Inputs	8301	0	3	BIT/BYTE	1	0
<input type="checkbox"/>	1:Parallel Error, 0:noError	Discrete Inputs	8302	0	3	BIT/BYTE	2	0
<input type="checkbox"/>	1:ELAN Error, 0:noError	Discrete Inputs	8303	0	3	BIT/BYTE	3	0
<input type="checkbox"/>	1:TC Error, 0:noError	Discrete Inputs	8304	0	3	BIT/BYTE	4	0
<input type="checkbox"/>	1:Auto, 0:Manual	Discrete Inputs	8305	0	3	BIT/BYTE	5	0
<input type="checkbox"/>	1:Parallel (Master or Icirc only), 0:Single	Discrete Inputs	8306	0	3	BIT/BYTE	6	0
<input type="checkbox"/>	1:Remote, 0:Local	Discrete Inputs	8307	0	3	BIT/BYTE	7	0

Figure 85: MODBUS indications

Table 64: MODBUS indications

Setting	Format	Range	Default	Description
Function	-	0 to 999	0	Function number
Address	-	0 to 65535	0	Address
Class	-	0 to 65535	0	Class
Device offset		0 to 999	0	Indication device offset
Dev type	-	0 to 999	0	Indication device type
Deviation	float		0	Absolute deviation value
Scale	float		0	Scale value
Max. value	float	0 to 65535	0	Max. value
Description	text	50 chars	empty	User description

18.5.3 Commands

Table of settings of individual commands represents command settings. This table is common for all a.eberle devices connected to the telecontrol board.

The upper line contains execution buttons for work with the individual command lines and for export/import of the entire table of commands.

Selected line in the table is marked by yellow background. All changes have to be confirmed by using the *Confirm* button.

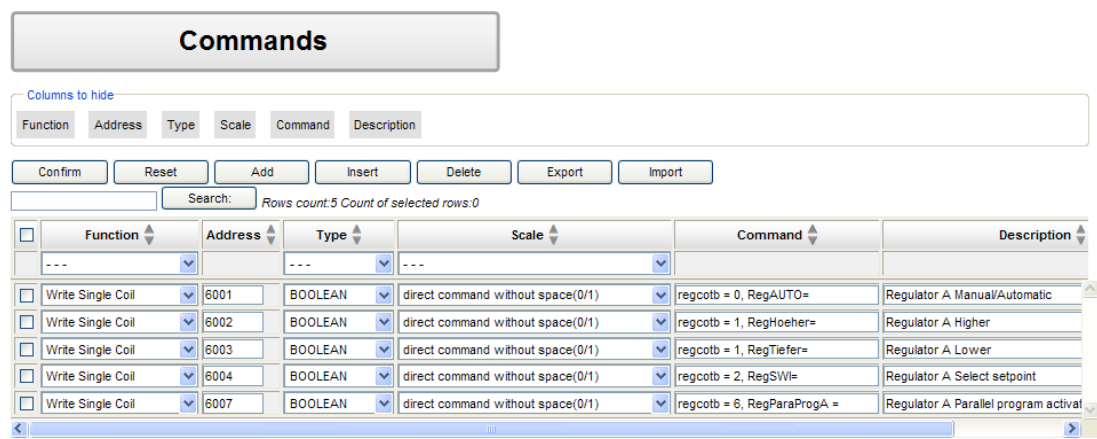


Figure 86: MODBUS commands

Table 65: MODBUS Commands

Setting	Format	Range	Default	Description
Function	-	1 to 128	1	Function number
Address	-	1 to 128	0	Information address
Type	-	1 to 128	0	Data type
Scale	-	1 to 128	0	Scale
Max value	-	1 to 128	0	Maximum value
Command	text	50 chars	empty	Command string
Description	text	50 chars	empty	User description

# 19. C37.118 Settings

## 19.1 Basic

Basic settings tree branch form contains common settings of for C37.118 protocol.

Basic

Settings description: C37118\_GDASys\_BASIC

Protocol settings

Line type: ethernet - TCP

PMU units base identifier: 100

Authorized central stations IP addresses: 192.168.1.92 192.168.1.64 192.168.1.43

Confirm Reset

Figure 87: C37.118 basic settings

Table 66: C37.118 basic settings

Setting	Format	Range	Default	Description
Settings de- scription	Text	50 charac- ters	Filename of open settings	Short user description of settings file or name of settings file.
Line type	-	Selection of values in combo box	Ethernet - TCP	Type of line for C37.118 protocol (Ethernet, serial line)
PMU base iden- tifier	-	1 to 65535	100	Base identifier of virtual PMU de- vices defined by firmware; individual PMU identifiers are defined as Base Identifier + PMU Order Number (e.g. Base Identifier = 100, PMU identifiers are 101, 102 ...).
Authorized central stations IP addresses	-	4x 0 to 255	As defined in the template	IP address of central stations (SCADAs) authorized to communi- cate with telecontrol board using C37.118 protocol.

## 19.2 Advanced

### 19.2.1 Serial Port Assignment

Serial Port assignment tree branch form contains common settings of serial ports for protocols available in C37.117 firmware. This WinConfig page also contains internal checks to assure that each serial port can be used only one time in the configuration.

Serial Ports Settings

Confirm

Reset

Enabled	Usage	Port	TCP port
<input checked="" type="checkbox"/>	Internal device interface	COM2	
<input type="checkbox"/>	SCADA protocol interface	COM1	
<input checked="" type="checkbox"/>	DCF serial port	COM1	
<input checked="" type="checkbox"/>	COM-Server serial port	COM3	5013

Figure 88: C37.118 Serial Port Assignment

Table 67: C37.118 Serial Ports Settings

Setting	Format	Range	Default	Description
Enabled		checkbox	Checked/ Unchecked	Assignment of serial ports for protocols used by firmware. Telecontrol protocol for internal communication with device GDASys is always checked.
Usage	-	-	-	Explanation of usage of the corresponding port.
Port	-	Selection of values in combo box	As defined in template	COM port number used for the corresponding protocol. Each port can be used only for one of defined protocols.



### 19.2.2 Settings – SCADA

Settings – SCADA tree branch form contains settings of SCADA-related parameters, namely important communication parameters of the C37.117 protocol.

C37.118 settings

Interface settings

Line type: ethernet - TCP

TCP port (data transfer): 4712

Protocol settings

PMU units base identifier: 100

Authorized central stations IP addresses: 192.168.1.92 192.168.1.64 192.168.1.43

Mode of watchdog LED: blinking

ID	Comment	Name
101		1234567890123456
102		GDASys-Nr1-50s

Figure 89: C37.118 SCADA Settings

Table 68: C37.118 SCADA Settings

Setting	Format	Range	Default	Description
Line type	-	Selection of values in combo box	Ethernet - TCP	Type of line for C37.118 protocol (Ethernet, serial line)
TCP port (data transfer)	-	-	-	Explanation of usage of the corresponding port.
Port	-	1 to 65535	4712	TCP port used for C37.118 protocol.
PMU base identifier	-	1 to 65535	100	Base identifier of virtual PMU devices defined by firmware; individual PMU identifiers are defined as Base Identifier + PMU Order Number (e.g. Base Identifier = 100, PMU identifiers are 101, 102 ...).
Authorized central stations IP addresses	-	4x 0 to 255	192.168.1.92 192.168.1.64 192.168.1.43	IP address of central stations (SCADAs) authorized to communicate with telecontrol board using C37.118 protocol.
ID	-	-	-	Read-only ID of virtual PMU in C37.118 communication; ID is defined by PMU base identifier
Comment	text	50 characters	""	User comment
Name	Text	50 characters	As defined in template	Name of virtual PMU in C37.118 communication

### 19.2.3 ComServer

ComServer tree branch form contains settings of ComServer -related parameters.

COM-Server

Confirm

Reset

Add

Insert

Delete

Rows count:1

Extend

<input type="checkbox"/>	Activate	Connection type	IP address	TCP port	Inactivity timeout [s]	Serial port	Baud rate	Parity	XON/XOFF	RTS/CTS
<input type="checkbox"/>	Yes	Socket	0.0.0.0	5004	0	COM3	115200	None	No	Yes

Figure 90: C37.118 ComServer Settings

Table 69: C37.118 ComServer Settings

Setting	Format	Range	Default	Description
Activate	-	Selection of values in combo box	Yes	Activation
Connection type	-	Selection of values in combo box	Socket	Connection type
IP address	-	4x 0 to 255	0.0.0.0	IP address
TCP port	-	1 to 65535	1023	CS TCP port.
Inactivity timeout	s	1 to 65535	60	Inactivity timeout
Serial port	-	-	COM3	Read only; CS serial port defined in Serial Ports Assignment page
Baud rate of serial port	-	Selection of values in combo box	115200	Baud rate of serial port
Parity	-	-	NONE	Read only; Parity
Stop bits	-	-	1	Read only; Stop bits
Data bits	-	-	8	Read only; Data bits
XON/XOFF	-	Selection of values in combo box	Yes	XON/XOFF handshaking
RTS/CTS	-	Selection of values in combo box	No	RTS/CTS handshaking
Interface type	-	-	RS232	Read only; interface type
Max. message length	-	0 to 65535	0	Max. message length
Tx blocking time	ms	0 to 65535	0	Tx blocking time



### 19.2.4 Supervisory

Supervisory settings allow user to define logging options to see log of C37.118 conversion operation.

Supervisory

Trace-options

Logging Type

Level: 

Deactivate

Trace Output

Trace via PARAM-connector (limited capacity due to RS232-bottleneck): ☒

Trace via TCP-Port (recommended): ☐

Eberle-Device

Link Layer: ☐

Application Layer: ☐

C37.118 Protocol

Link Layer: ☐

Application Layer: ☐

DCF77 Trace

Activate trace ☐

Level: 

User

TCP port: 

10777

COM-Server Trace

Activate trace ☐

Level: 

User

Trace via PARAM-Connector (limited capacity due to RS232-bottleneck): ☒

Trace via TCP-Port (recommended): ☐

TCP-Port: 

10888

Logging with Timestamp (Performance reduction!): ☒

COM-Server Tx-Rx Mirroring

Activate trace ☐

TCP-port: 

23456

Confirm

Reset

*Figure 91: C37.118 Supervisory settings*

Table 70: C37.118 Supervisory settings

Setting	Format	Range	Default	Description
Level	-	Selection of values in combo box	Deactivate	Level of Log messages
Trace output	-	radio button	PARAM-connector	Option to trace via PARAM connector or via TCP
Eberle-Device: Link Layer	-	checkbox	unchecked	Level of Log in device communication
Eberle-Device: Application Layer	-	checkbox	unchecked	Level of Log in device communication
C37.118 protocol: Link Layer	-	checkbox	unchecked	Level of Log in C37.118 protocol communication
C37.118 protocol: Application Layer	-	checkbox	unchecked	Level of Log in C37.118 protocol communication
DCF77: Activate trace		checkbox	unchecked	Trace activation
DCF77: Level	-	Selection of values in combo box	Deactivate	Level of Log messages
DCF77: TCP port	-	1 to 65535	10777	TCP port
COM-Server Trace: Activate trace		checkbox	checked	Protocol debug option activation
Level	-	Selection of values in combo box	user	Option to select lever of supervisory messages (user, developer)
Trace via PARAM-Connector)	-	radio button	checked	Logging to PARAM-Connector
Trace via TCP-Port	-	radio button	unchecked	Logging to TCP port
TCP port	-	1 to 65535	10888	TCP port
Logging with Timestamp	-	checkbox	checked	Logging with Timestamp
Mirroring: Activate trace	-	checkbox	checked	Mirror port: Activate
TCP-port	-	1 to 65535	23456	TCP port

### 19.3 Linked Devices

Linked Devices page allows user to define virtual devices from the point of view of the RegSys internal communication.

Devices

Device	Enabled	Identifier of device	Poll type
1	<input checked="" type="checkbox"/>	AA:	RPS
2	<input checked="" type="checkbox"/>	AA:	RPS
3	<input checked="" type="checkbox"/>	AA:	RPS
4	<input checked="" type="checkbox"/>	AA:	RPS
5	<input type="checkbox"/>	AA:	RPS
6	<input type="checkbox"/>	AA:	RPS
7	<input type="checkbox"/>	AA:	RPS
8	<input type="checkbox"/>	AA:	RPS

Confirm

Reset

Figure 92: C37.118 Linked Devices

Table 71: C37.118 Linked Devices

Setting	Format	Range	Default	Description
Device	-	-	-	Read only; order number of device from the point of view of RegSys communication
Enabled	-	checkbox	Checked/ unchecked	Option whether the corresponding device is enabled
Identifier of device	text	checkbox	AA:	Identifier of the device in RegSys communication
Poll type	-	-	RPS	Read only; Poll type

### 19.3.1 Time Synchronization

Time Synchronization page sets time synchronization options.

Time synchronization

NTP specific

NTP primary server IP address:0.0.0.0

NTP secondary server IP address:0.0.0.0

DCF77 synchronization specific

Version1.04.00 build 10

DCF77 clock activate:☒ Yes ☐ No

Serial port:COM1

Interface mode:RS485

Confirm

Reset

Figure 93: C37.118 Time Synchronization

Table 72: C37.118 Time synchronization

Setting	Format	Range	Default	Description
Time source	-	checkbox	NTP	Read only; NTP time source
Synchronize all devices connected to ELAN	-	checkbox	Unchecked	Option whether synchronize all devices connected to ELAN
Sync. period of connected devices	min	0 to 999	1	Synchronization period of connected devices
NTP primary server IP address	-	4x 0 to 255	0.0.0.0	NTP primary server IP address
NTP secondary server IP address	-	4x 0 to 255	0.0.0.0	NTP secondary server IP address



19.3.2 Internal communication

Internal communication page allows user to set parameters of internal communication with RegSys device.

Internal communication

Baud rate of device serial port [Bd]:

115200

Parity:

EVEN

ON time of serial LEDs [ms]:

100

Timeout for reception of first char [ms]:

200

Inter character timeout [ms]:

150

TX blocking [ms]:

50

Confirm

Reset

Figure 94: C37.118 Internal communication

Table 73: C37.118 Internal communication

Setting	Format	Range	Default	Description
Baud rate of device serial port	Bd	Selection of values in combo box	115200	Baud rate of device serial port
Parity	-	Selection of values in combo box	EVEN	Parity of device serial port
ON time of serial LEDs	ms	1 to 65535	100	ON time of serial LEDs
Timeout for reception of first char	ms	1 to 65535	200	Timeout for reception of first char
Inter character timeout	ms	1 to 65535	150	Inter character timeout
TX blocking	ms	0 to 255	50	TX blocking

19.3.3 Device x

Device x page sets device-related parameters of internal communication.

Device Request Settings

Identifier of device:

AA:

Data class:

12

Class type:

interval

Cycle time of poll [ms]:

2000

Length of response:

142

Number of data buffers:

1

Full buffer policy:

Drop older data

Offset of value in REG response:

0

Comment:

5sec interval quantities: Data c

Confirm

Reset

Figure 95: C37.118 Device x

Table 74: C37.118 Device Request Settings

Setting	Format	Range	Default	Description
Identifier of de-vice	-	-	AA:	Read only: Identifier of device
Data class	-	1 to 255	As defined in template	Device data class
Class type	-	Selection of values in combo box	As defined in template	Class type
Cycle time of poll	ms	1 to 65535	2000	Cycle time of poll
Length of re-sponse	-	1 to 65535	142	Length of response
Data buffers	-	1 to 255	As defined in template	Data buffers
Offset of priority value in REG re-sponse	-	1 to 65535	-	Offset of priority value in REG response
Comment	string	50 charac-ters	As defined in template	User comment

### 19.3.4 Indications

Indications page sets parameters of individual data points.

Indications

Columns to hide

Description

Data class buffer

Buffer offset

PMU ID

PMU data field

Data field offset

Data point name

Confirm

Reset

Add

Insert

Delete

Export

Import

Search:

Row count:57 Count of selected rows:0

<input type="checkbox"/>	Description	Data class buffer	Buffer offset	PMU ID	
<input type="checkbox"/>				---	-
<input type="checkbox"/>	Phase-to-phase RMS-voltage L1-L2	0	10	101	a
<input type="checkbox"/>	Phase-to-phase RMS-voltage L2-L3	0	14	101	a
<input type="checkbox"/>	Phase-to-phase RMS-voltage L3-L1	0	18	101	a
<input type="checkbox"/>	Average of collective voltage	0	22	101	a

Figure 96: C37.118 Indications

Table 75: C37.118 Indications

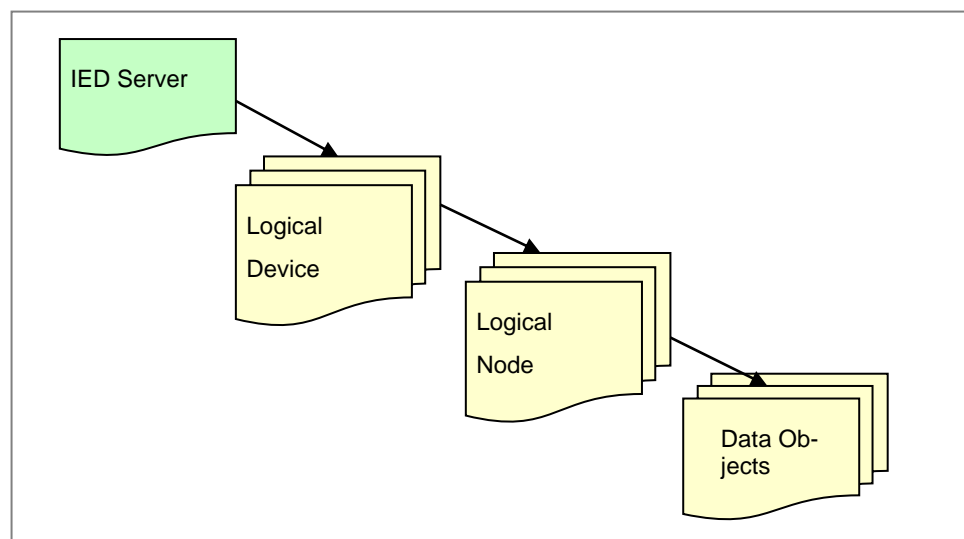
Setting	Format	Range	Default	Description
Description	string	100 characters	As defined in template	Description
Data class buffer	-	0 to 254	As defined in template	Data class buffer
Buffer offset	-	0 to 65535	As defined in template	Buffer offset
PMU ID	-	Selection of values in combo box	As defined in template	PMU ID in C37.118 communication
PMU data field	-	Selection of values in combo box	As defined in template	PMU data field in C37.118 communication
Data field offset	-	0 to 65534	As defined in template	Data field offset in C37.118 communication
Data point name	-	16 characters	As defined in template	Data point name in C37.118 communication

## 20. IEC61850

### 20.1 General Information

The firmware, according to IEC 61850-6, imports an SCL file with name space definitions. The contents of described attributes are used to generate a project specific MMS-context from SCL file. The project specific file with extension .ICD is located in settings with \*.xml file.

WinConfig and SCL\_Config engineering Tool represent for REG-PE / REG-PED all data attributes as product (IED) model.



*Figure 97: Product (IED) Model*

- IED - substation automation (SA) device performing SA functions by means of logical nodes (LNs). It allows access via the communication system and is the only access point to the data of the logical devices and logical nodes contained in the server.
- LDevice - a logical device (LD), according to IEC 61850-7-2, that is contained in the server of IED.
- LNode - a logical node (LN). The LN contains Data (DO), which other logical nodes request, and it may need DOs contained in other LNs to perform its function. The offered DOs (server capability) are described in ICD - file.
- DO - the DATA contained in the LNs.

The tree view sub-entries of the server are directly resolved from the name space of the ICD file.

### 20.2 SCL\_Config engineering Tool

This Tool lets you do the following:

- creating new project of WinConfig settings with ICD-file,

- creating new project of archive jffs2.tar with ICD-file from a template project or other archive,
- creating new project of WinConfig settings from archive jffs2.tar,
- viewing the ICD-file in a tree structure,
- using this tool as project-independent basis to edit objects and nodes of ICD-file in a comfortable way for project specific use. I.e. a common base can be modified to fit your project depending settings.
- viewing and editing the GOOSE publishers and subscribers.

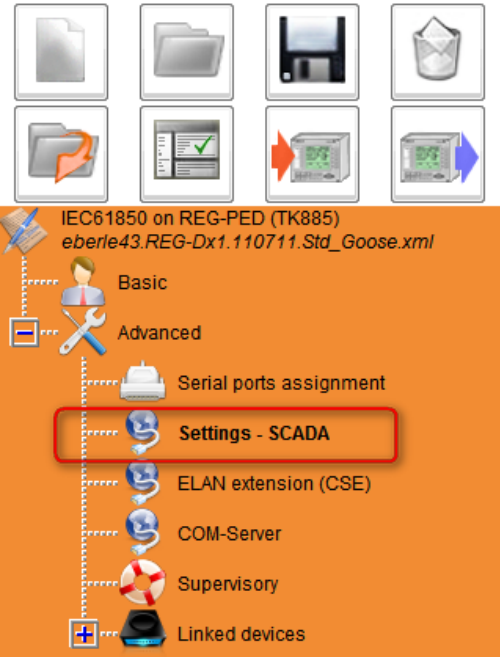


Figure 98: SCADA Settings

## IEC61850

Version of settings:

Control version number:

Mode of watchdog LED:

Firmware version:

Firmware build:

ICD file name:

TCP configuration

Configure TCP ☐

Here to execute a SCL\_Config IEC61850-engineering tool.

Figure 99: Execute SCL\_Config engineering Tool

After the adjust and save in SCL\_Config engineering Tool, all changes have to be activated in WinConfig automatically.

The tree view subentries of the server are directly resolved from the name space of the ICD file. This defines that there may be different names for the logical devices and their subordinated Nodes and their subordinated attributes.

That’s why only an example can be discussed in the description.

20.2.1     **Displaying project configuration and properties of nodes**

ICD-file is shown as the logical structure tree on page “Configuration”. On the right panel of the page section “IED” parameters are shown, as well as options of the configuration logical object and options of the field sAddr, if exists in the chosen object DAI.

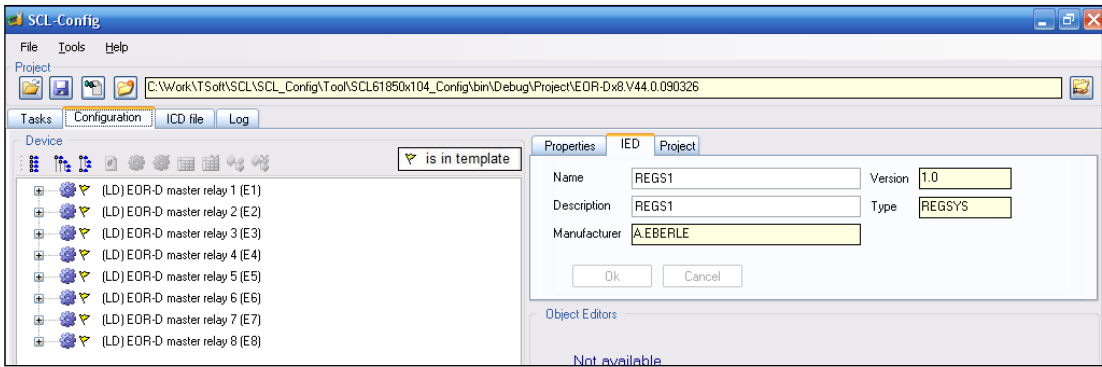


Figure 100: Displaying the project configuration

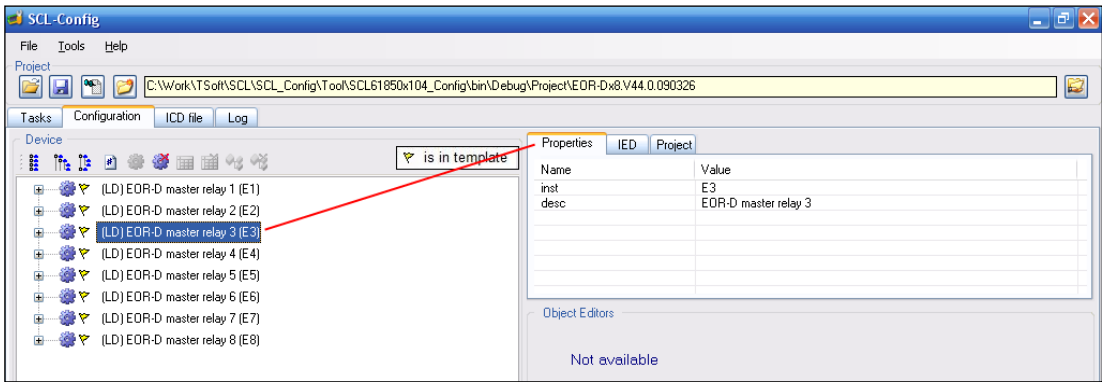


Figure 101: Displaying the properties of nodes

## 20.2.2 Displaying source (ICD-file)

Full original ICD-configuration file is displayed on the page "ICD file". You can stay and expand individual nodes configuration similar to the display of XML-files in Microsoft Internet Explorer.

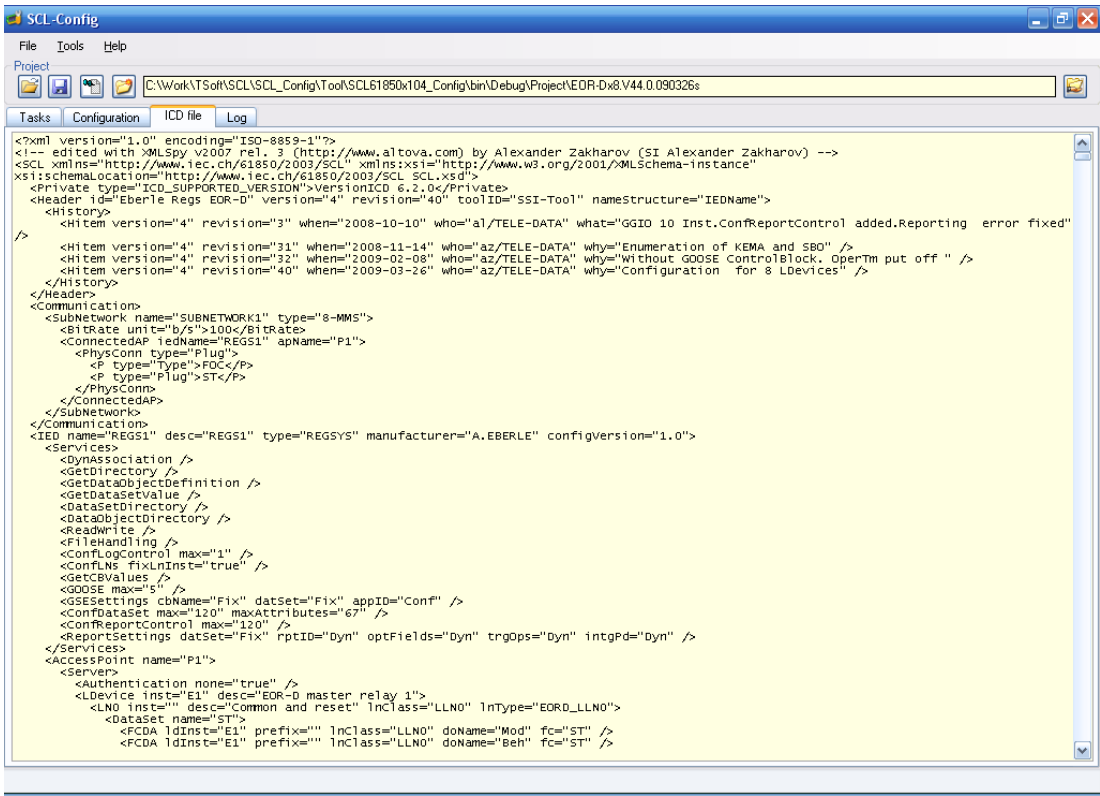


Figure 102: Displaying the ICD file

### 20.2.3 Adding, deleting and renaming devices

Configuration change is done on the page "Configuration". To change the content of the device and its name use hot-keys and popup menu panel "Device".

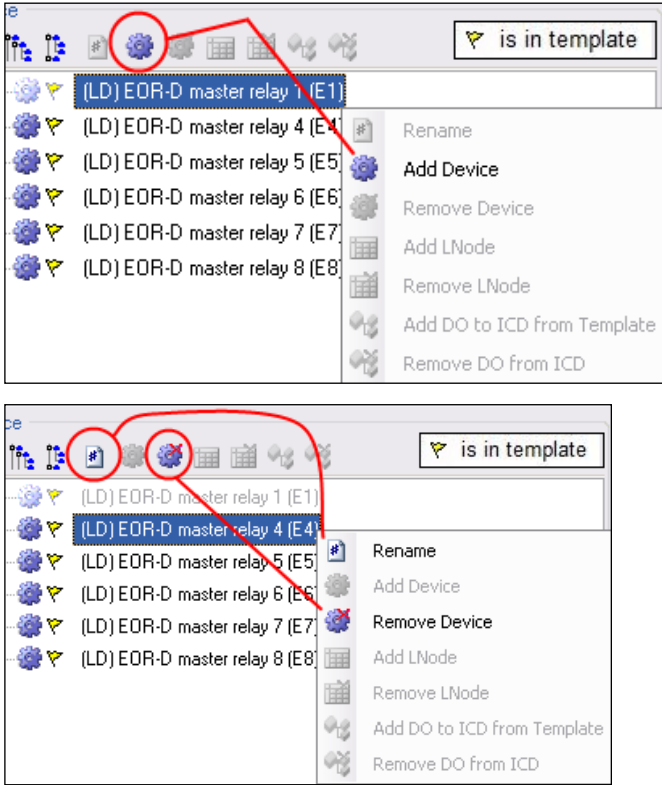


Figure 103: Adding and deleting devices

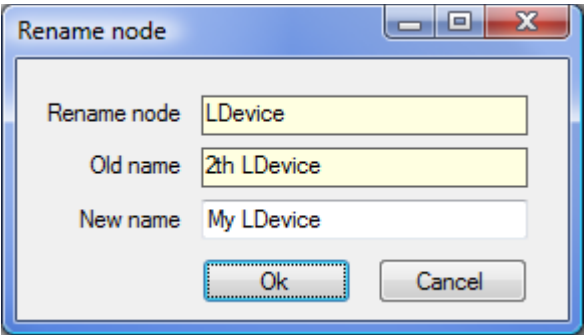


Figure 104: Renaming device



### 20.2.4 Adding, deleting and renaming logical nodes

To add new logical nodes of the necessary type, to rename or delete from the configuration use hot-keys and popup menu of the panel “Device”.

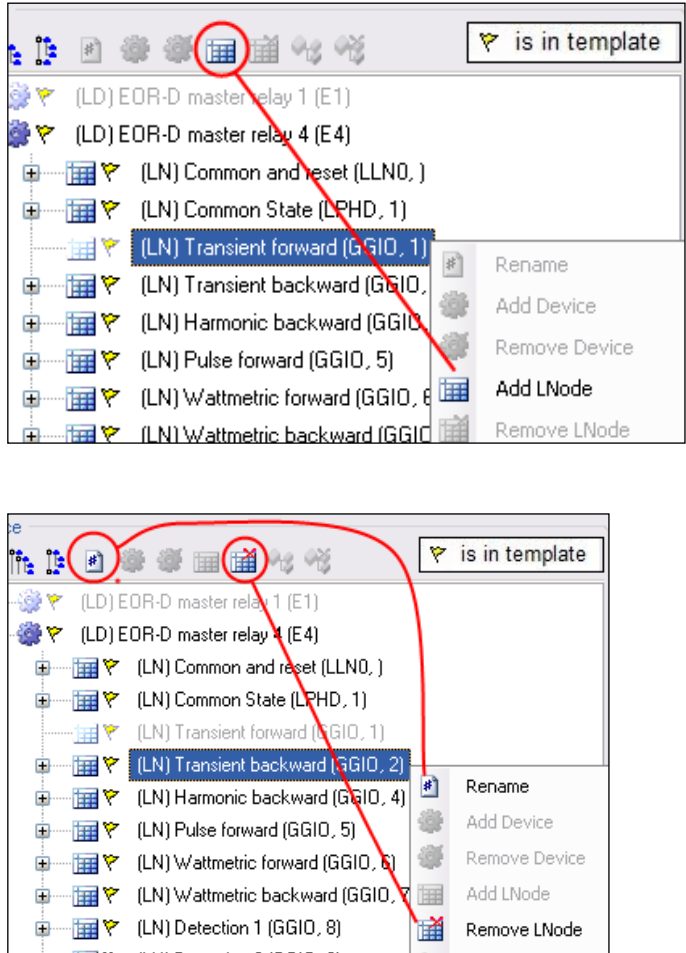


Figure 105: Adding, deleting and renaming logical nodes

### 20.2.5 Editing sAddr

Upon choosing DAI “stVal” on the right panel “sAddr Editing” parameters’ editor of sAddr field is available. To accept changes of the parameters press OK, to cancel the changes press Cancel.

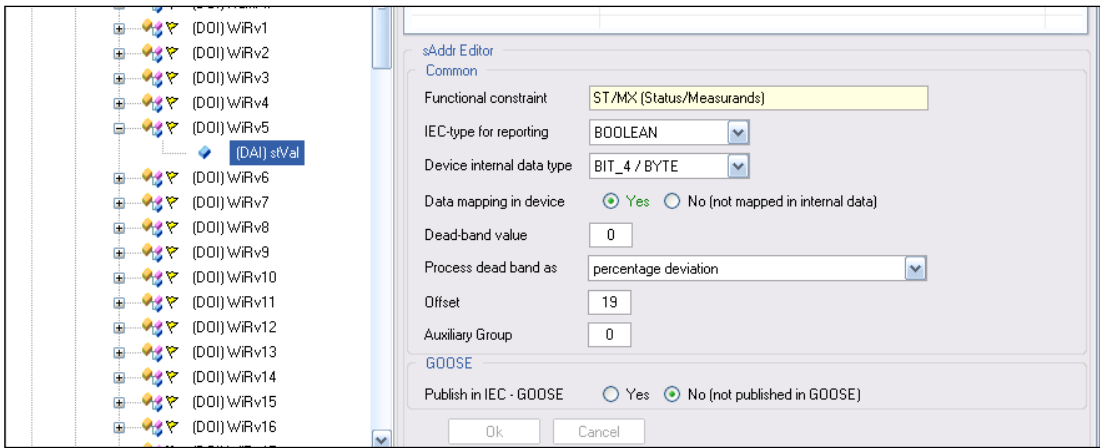
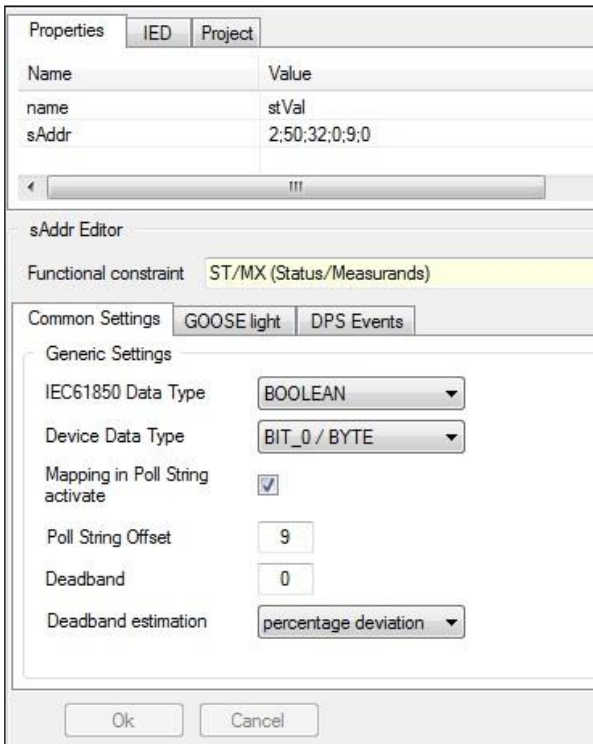


Figure 106: Editing sAddr

Such editors are accessible for the use:

ICD Template (sAddr) Type = “ASCIIx61850”, Record Type = “ST” (Status\Measurands)



sAddr Editor

Functional constraint ST/MX (Status/Measurands)

Common Settings GOOSE light DPS Events

GOOSE and auxiliary Settings

Using as Subscriber timeout-error alarm ☐

Number of the observed Subscriber (if set as alarm) Subscriber No.0

sAddr Editor

Functional constraint ST/MX (Status/Measurands)

Common Settings GOOSE light DPS Events

Behaviour as Event Settings

Auxiliary Group Group 0

Extended Syntax-Settings

Example DPS complex status object mapping:  
\$Evn:Bool:Off=19:Bit=0:DpHi; \$Evn:Bool:Off=19:Bit=1:DpLo

ICD Template (sAddr) Type = "ASCIIx61850", Record Type = "CO" (Control). The behavior of "scale" setting for DoublePoint, Boolean and other types is different.

Properties IED Project

Name	Value
name	ctlVal
sAddr	3:51:0:1;{.aa.q20=if.regup=1,else.regdown=1'.aa.q20 };{\$Chk:ChkVal:AddCa...

sAddr Editor

Functional constraint CO (Control)

Common Settings Pre-Conditions Acknowledgement

Common

Control Type IEC DOUBLEPOINT

Multi-Command activate ☐

Single Command

Settings

Command .aa.q20=if.regup=1,else.regdown=1'.aa.q20

Command Behavior

Type Command with value, default (0)

Example

if value	[00]	.aa.q20=if.regup=1,else.regdown=1'.aa.q200
if value	[01]	.aa.q20=if.regup=1,else.regdown=1'.aa.q201
if value	[10]	.aa.q20=if.regup=1,else.regdown=1'.aa.q202
if value	[11]	.aa.q20=if.regup=1,else.regdown=1'.aa.q203

Ok Cancel

sAddr Editor

Functional constraint **CO (Control)**

Common Settings Pre-Conditions Acknowledgement

Common

Control Type IEC **BOOLEAN**

Multi-Command activate ☐

Single Command

Settings

Command **.aa.q20=if,regup=1,else,regdown=1'.aa.q20**

Command Behavior

Type **Binary command without space, default (0)**

Example

if value	<b>FALSE</b>	<b>.aa.q20=if,regup=1,else,regdown=1'.aa.q200</b>
if value	<b>TRUE</b>	<b>.aa.q20=if,regup=1,else,regdown=1'.aa.q201</b>

sAddr Editor

Functional constraint **CO (Control)**

Common Settings Pre-Conditions Acknowledgement

Condition No.1 Condition No.2 Condition No.3

**Same as Checked Value**

Extended Settings

Checked Data Point Type **BIT\_7 / BYTE**

Poll String Offset **3**

Checked Value (optional) **1**

Minimal Position (optional) **0**

Maximal Position (optional) **0**

Allowed Command Value to leave minimal Position **0**

Allowed Command Value to leave maximal Position **0**

Additional Cause Diagnosis (IEC61850-8.1 AddCause) **Blocked-by-Mode**

sAddr Editor

Functional constraint **CO (Control)**

Common Settings Pre-Conditions Acknowledgement

Extended Settings

Check Behaviour **Every Change Acknowledgement**

Data Point Type **INT32U**

Poll String Offset **96**

Set Point (optional) **0**

Control Model (will be always changed dynamically after reset)

Control Model **Be equal to ctlModel in ICD**

ICD Template (sAddr) Type = "ASCIIx61850", Record Type = "SP" (Setpoint\Setting group).  
The behavior of "scale" setting for DoublePoint, Boolean and other types is different.

PropertiesIEDProject

Name	Value
name	f
sAddr	5;53;53;0;132;0;53;0;0;{REGSW1 =};{\$Chk:ChkVal:Off=3:Bit=7:Val=1; \$Chk:...

sAddr Editor

Functional constraintSP/SG/SE (Setpoint/Setting group)

Common Set-Point SettingsPre-Conditions

Read-Write Setting

Read-Write IEC Data TypeFLOAT32

Mapping in Poll String activate☒

Read-Write Device Data TypeFLOAT32

Read Poll String Offset132

Write CommandREGSW1 =

Scale

Scale in Write Command0

Command ExampleREGSW1 =VALUE

OkCancel

sAddr Editor

Functional constraintSP/SG/SE (Setpoint/Setting group)

Common Set-Point SettingsPre-Conditions

Read-Write Setting

Read-Write IEC Data TypeBOOLEAN

Mapping in Poll String activate☒

Read-Write Device Data TypeFLOAT32

Read Poll String Offset136

Write CommandREGSW2 =

Command Behavior

TypeBinary command without space, default (0)

Example

if value	FALSE	REGSW2 =0
if value	TRUE	REGSW2 =1

sAddr Editor

Functional constraint SP/SG/SE (Setpoint/Setting group)

Common Set-Point Settings Pre-Conditions

Condition No.1 Condition No.2 Condition No.3

Same as Checked Value

Extended Settings

Checked Data Point Type BIT\_7 / BYTE

Poll String Offset 3

Checked Value (optional) 1

Minimal Setpoint Value (optional) 0

Maximal Setpoint Value (optional) 0

Additional Cause Diagnosis (IEC61850-8.1 AddCause) recommended standard return

ICD Template (sAddr) Type = "PQIx850", Record Type = "ST" (Status\Measurands)

Properties IED Project

Name	Value
name	f
sAddr	2;53;53;3;74;0.001;0;{uid=1173}

sAddr Editor

Functional constraint ST/MX (Status/Measurands)

Common Settings GOOSE light Advanced

Generic Settings

IEC61850 Data Type FLOAT32

Device Data Type FLOAT32

Data Class PQI-D: 10 min interval / CPR-D: 10 min interval

Mapping in Poll String activate ☒

Poll String Offset 74

Deadband 0.001

Deadband estimation percentage deviation

Ok Cancel

sAddr Editor

Functional constraint **ST/MX (Status/Measurands)**

Common Settings GOOSE light Advanced

GOOSE and auxiliary Settings

Using as Subscriber timeout-error alarm ☐

Number of the observed Subscriber (if set as alarm) **Subscriber No.0**

sAddr Editor

Functional constraint **ST/MX (Status/Measurands)**

Common Settings GOOSE light Advanced

Behaviour as Event Settings

Auxiliary Group **Group 0**

Extended Syntax-Settings **uid=1173**

Status Request [optional]

ICD Template (sAddr) Type = "PQIx850", Record Types "CO" (Control) & "SP" (Set-point\Setting group) are not supported.

## 20.2.6 Removing Data Objects

Removing of DO is executed in two steps:

- when an user executes the function "Remove DO" in application:
  - verifications of name
  - mandatory DO list for LPHD Logical Node - "PhyNam", "PhyHealth", "Proxy", for other - "Mod", "Beh", "Health", "NamPlt". A removing the DO is blocked.
  - if DO is system, confirmation of operation is required. A not system DO has a DA with name "dataNs"
  - ICD can have more than one of Logical Node same type, that means all these DO will be removing. List of LN will be shown and confirmation of operation is required
  - removing DOI from LNode
  - excluding empty Data Sets
  - excluding Reports without data set.
- when an user closes project - removing unused DO's types from the section "DataTypeTemplates"

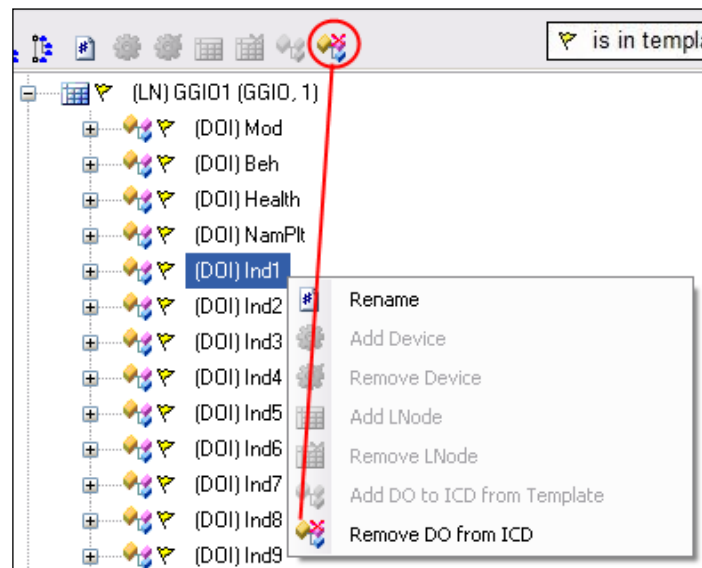


Figure 107: Removing Data Objects

## 20.2.7 Restore Data Objects from Template

Restoring of DO is executed when an user executes the function “Restore DO” in application. Based on a template (original ICD-file) is created:

- in the section “DataTypeTemplates” - DO Type and DO for LNodeType, if they are not exists
- DOI for all LNode of the LNodeType
- DataSet and Report, if they are not exists

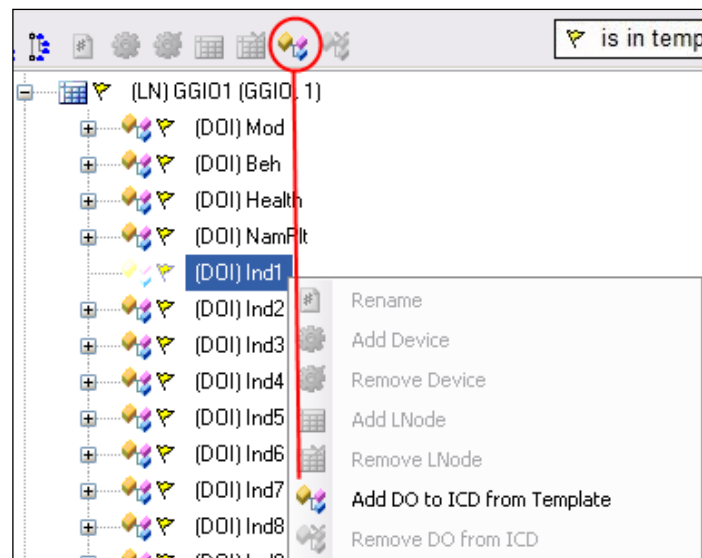


Figure 108: Restore Data Objects from template



## 20.2.8 Renaming Data Objects

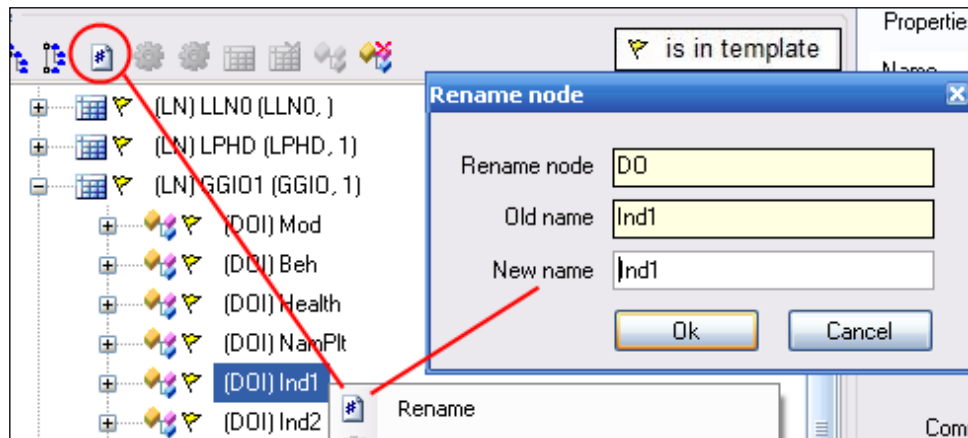


Figure 109: Renaming the Data Objects

### Algorithm of renaming DO

1. verifications of old name
  - Mandatory DO list for LPHD Logical Node - "PhyNam", "PhyHealth", "Proxy", for other - "Mod", "Beh", "Health", "NamPlt". A change the name is blocked.
  - If DO is system, confirmation of operation is required. A not system DO has a DA with name "dataNs".
  - ICD can have more than one of Logical Node same type, that means all these DO will be renamed.

### List of LN will be shown and confirmation of operation is required

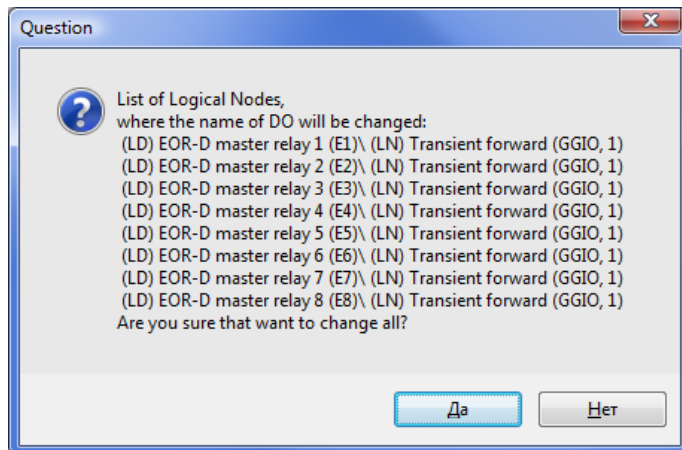
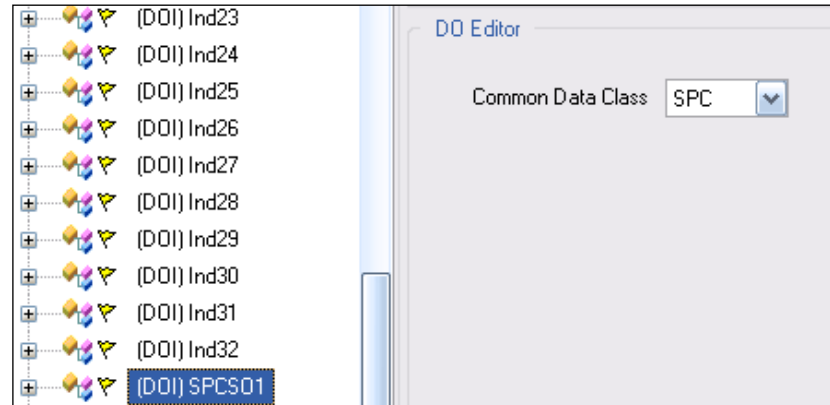


Figure 110: Confirmation to rename DO list

1. verifications of new name
  - A change the name from mandatory DO list is blocked.
  - If the new name exists, renaming is canceled
2. Rename DO in LNodeType from section "DataTypeTemplates"
3. Rename DOI in Logical Node
4. Rename FCDA in DataSets of Logical Node

### 20.2.9 Changing of DO Data Class

Changing of DO Data Class is accessible for changing “SPC” to “DPC” and vice versa. In this case DO Editor is displaying on editor panel.



*Figure 111: Changing of DO Data Class*

#### Algorithm of changing of DO Data Class:

1. Changing of DO Data Class is accessible for changing “SPC” to “DPC” and vice versa
2. Search DOType in LNodeType from section “DataTypeTemplates” where:
  - “id” = new type (“SPC” or “DPC”)
  - DOType has not DA with name “SBOW”
  - If DOType has DA with name “dataNs”, it is preferring
3. Setting the new value of Type Id for DO
4. DO will to have new Data Class
5. If new DOType is not searched, then changing is canceled

## 20.2.10 Changing the control model for controllable data objects



For “Status only” Data Objects a control model does not change.

Changing of DO Data Class is accessible for four control models:

- Direct with normal security
- SBO with normal security
- SBO with enhanced security
- Direct with enhanced security

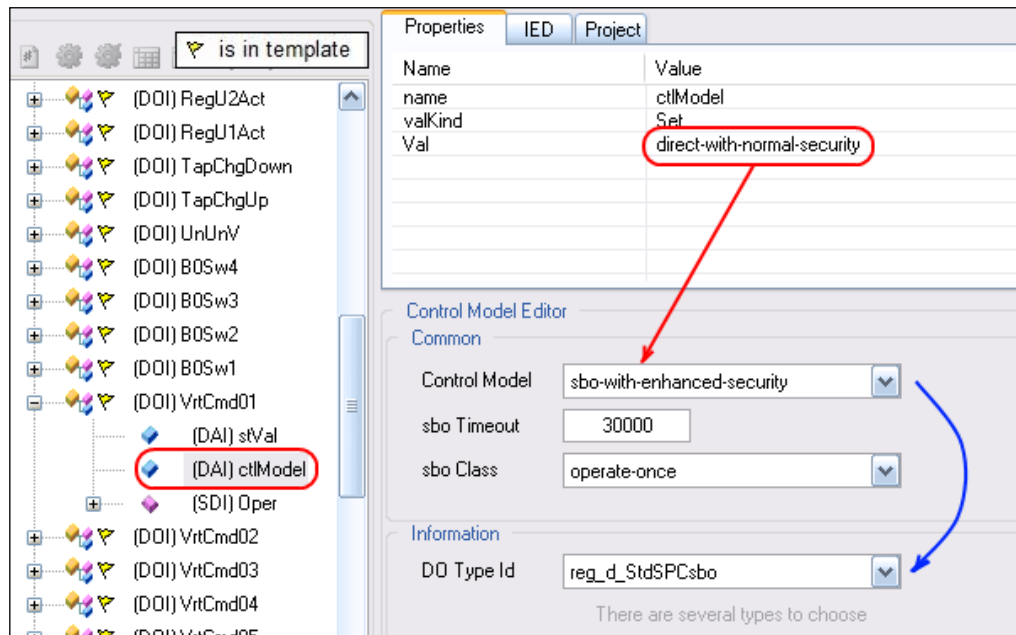


Figure 112: Changing the control model for controllable data objects

User is able to select a control model from the drop-down list “Control Model”. The program finds new DO type for selected model by algorithm:

1. New DO type has the same Data Class;
2. Direct with normal security requires mandatory Data structure Oper;
3. SBO with normal security requires mandatory Data attribute SBO, mandatory Data structure Oper and optional Data structure Cancel. Cancel can be omitted if cancel service is unsupported;
4. SBO with enhanced security requires mandatory Data structure SBOw, mandatory Data structure Oper and optional Data structure Cancel. Cancel can be omitted if cancel service is unsupported;
5. Direct with enhanced security requires mandatory Data structure Oper and optional Data structure Cancel. Cancel can be omitted if cancel service is unsupported;

Can be searched several types. In this case user can select from choose one.

If “sbo” type is selected, the user is able to edit “sboTimeout” and “sboClass” DAs.

After a confirmation a program changes a type of DO and brings all DAs conformably with selected DO type (fig. 29 & 30)

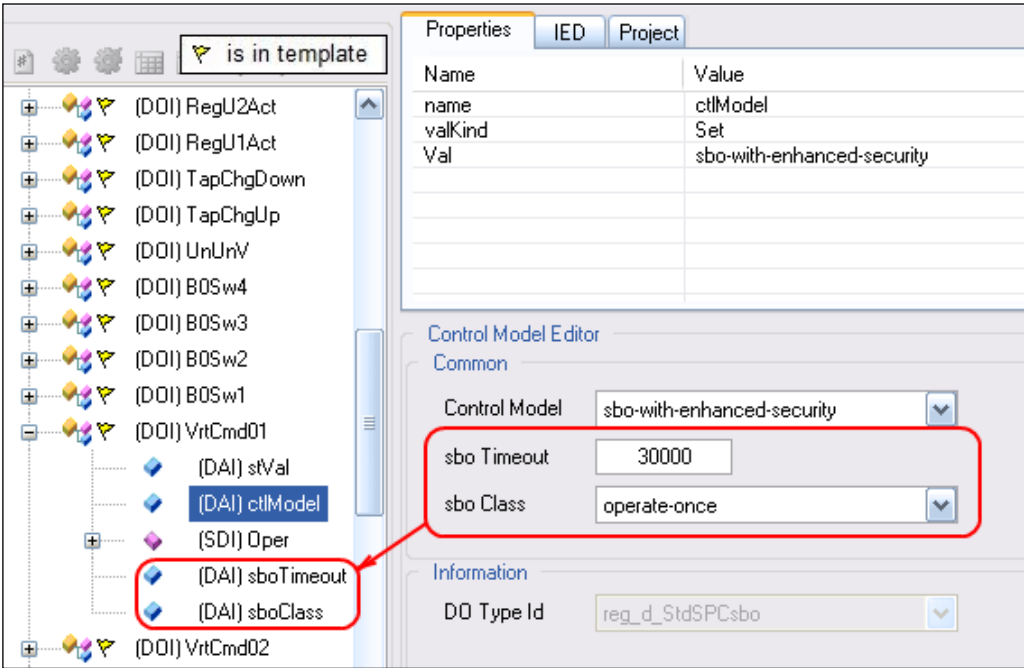


Figure 113: New attributes for selected “sbo” control model

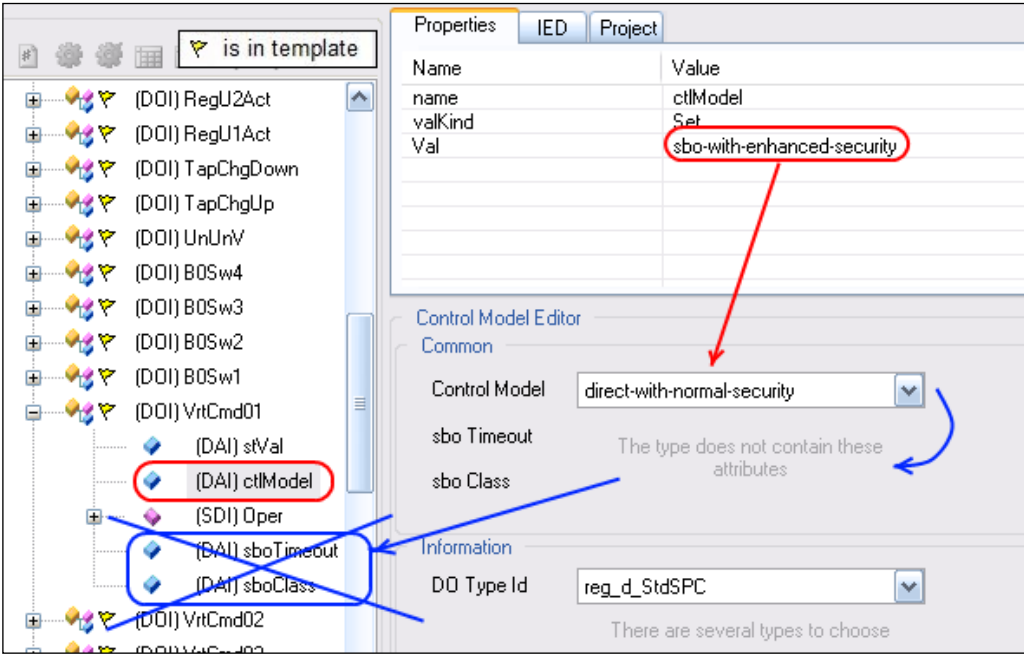


Figure 114: Excluded attributes for selected “direct” control model

## 20.2.11 GOOSElight Support

GOOSElight contains the settings for Publisher and Subscriber sides. These are different and perform different functions. SCL\_Config provides the ability to create, to edit, to adjust and to save all settings for both sides. All functions are available on "GOOSElight" page of application.

All GOOSE settings are saved in form of "param" files:

- for project type "Archive Tar" inside archive (jffs2.tar)
- for project type "WinConfig" in settings file (xml) as CData sections

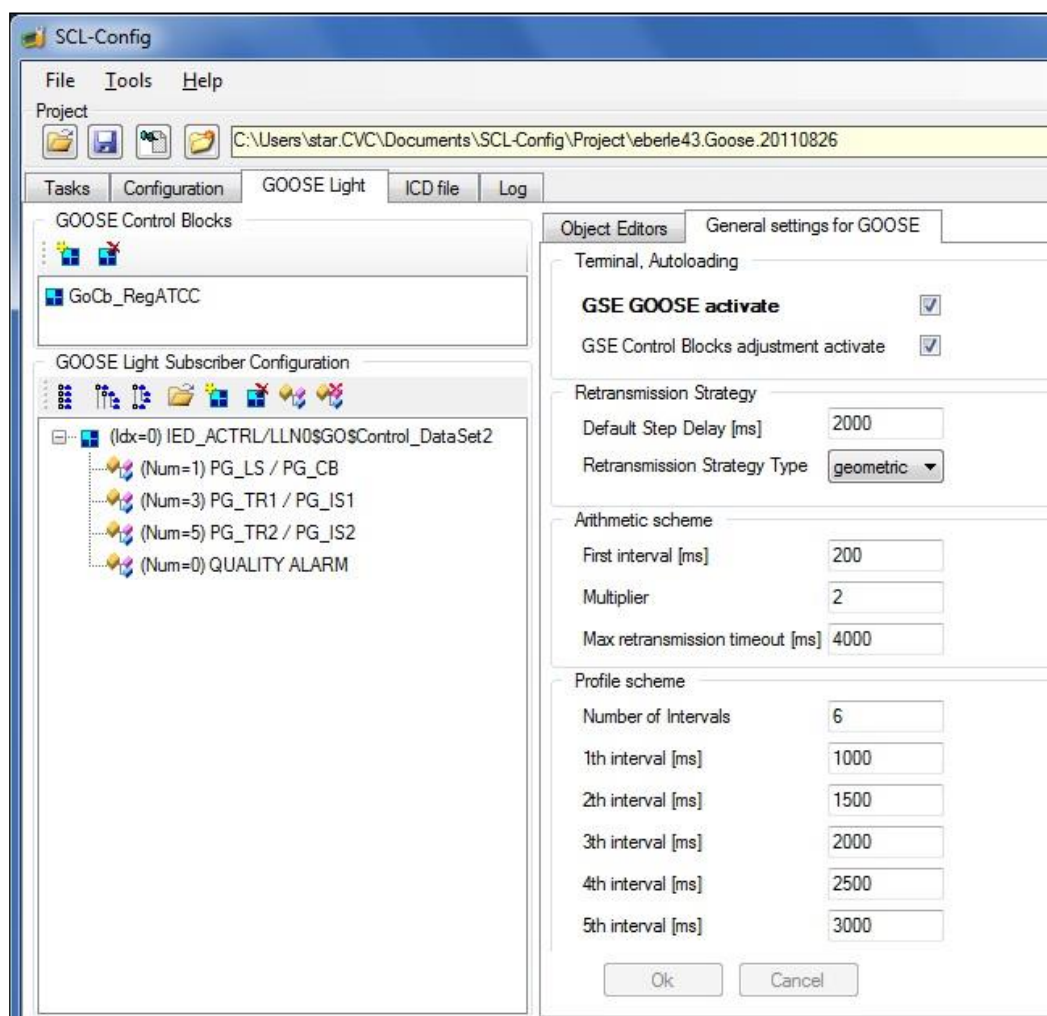


Figure 115: GOOSE settings page

### 20.2.11.1 Limitations and scope

The GOOSE features are applied only for sAddr type "ASCIIx61850".

Attributes that can be added to the GOOSE publisher Data Set :

- "stVal",
- "mag.f",
- "valWTr.transInd",

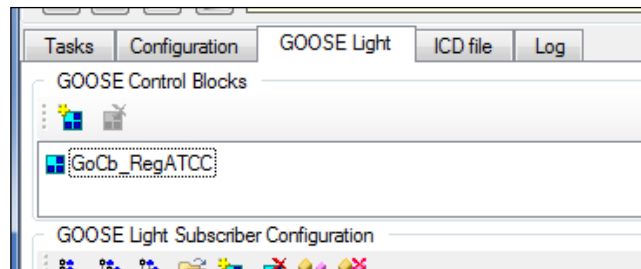
- “valWTr.posVal”,
- “q”

#### 20.2.11.2 Common GOOSE Settings for Publisher side

Editor “General Settings for GOOSE” provides editing common settings - activation, timing strategy, and timing settings.

#### 20.2.11.3 GOOSE Publisher Control Block functions

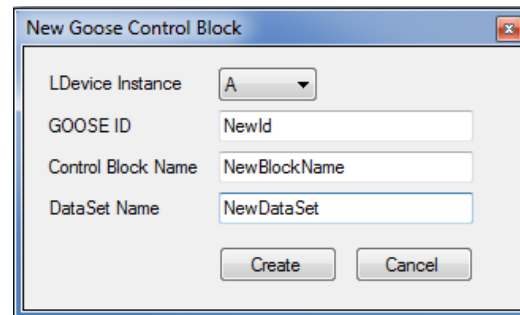
The GOOSE Publisher Control Block List is available on the “GOOSE Control Blocks” box.



*Figure 116: GOOSE Control Blocks list*

Selected block can be removed using function “Remove GOOSE Control Block”. When user deletes a block, the ICD sections for this block are removed – “GSE”, “GSEControl”, “DataSet”.

Function “Add GOOSE Control Block” will prompt to define the required parameters for the new block. The new block will be shown in the list. The maximum number of blocks is 4.



*Figure 117: Parameters for the new GOOSE Control Block*

#### 20.2.11.4 GOOSE Publisher Control Block settings

For the selected in the list GOOSE control block is available to view and edit the parameters of this block. The properties editor has 3 pages of settings.

Page “Common Settings” allows defining names and descriptions of main sections.

GOOSE Control Block Editor

Common Settings   Communication Settings   Data Set

LDevice Instance: A

GOOSE ID: Gold\_Reg214

Control Block Name: GoCb\_Reg214

DataSet Name: GoDs\_Reg214

Control Block Description: All-in-One State-Binary

DataSet Description: All GOOSE states and binaries inputs

Figure 118: Common settings of the GOOSE Control Block

Page “Communication Settings” allows defining MAC address.

GOOSE Control Block Editor

Common Settings   Communication Settings   Data Set

MAC-Address: 01-0C-CD- 01-0A-01

APPID: 1

VLAN-PRIORITY: 4

VLAN-ID: 000

Figure 119: Communication settings of the GOOSE Control Block

Page “Data Set” shows the Data Set of the Control Block and allows editing it. Functions “Data Object Up”, “Data Object Down” and “Remove Data Object” are processing all Data Attributes records for current Data Object. Functions “Data Attribute Up” and “Data Attribute Down” are changing order of Data Attributes records for current Data Object.

GOOSE Control Block Editor

Common Settings   Communication Settings   Data Set

	Order	LN Class	LN Inst	DO Name	DA Name
▲	1	ATCC	1	Loc	stVal
▼	2	ATCC	1	Loc	q
↺	3	GGIO	4	RemMode	stVal
↻	4	GGIO	4	RemMode	q
✕	5	ATCC	1	OpCntRs	stVal
	6	ATCC	1	OpCntRs	q
	7	GGIO	4	TapPos	stVal
	8	GGIO	4	TapPos	q
	9	GGIO	4	TapTrans	stVal

Figure 120: Data Set of the GOOSE Control Block

Adding the Data Object to Data Set of GOOSE Control Block is done in a device tree. For the selected Data Object is used function “Add DO to GOOSE Control Block”.



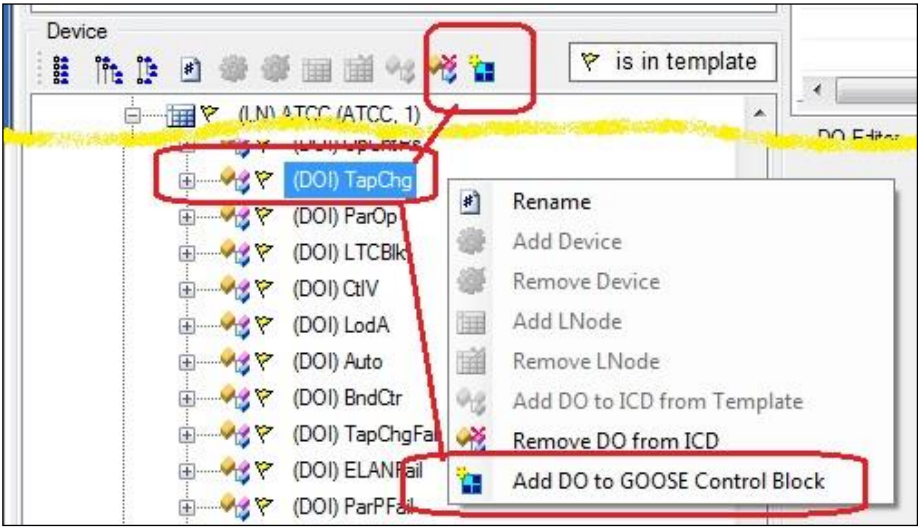


Figure 121: Adding the Data Object to Data Set of GOOSE Control Block

Before adding it will be necessary to select a Control Block and Data Attributes. Attributes list is defined by a Data Object type from template section of ICD.



Figure 122: Adding the Data Object to Data Set of GOOSE Control Block

Note: For structure “valWTr” data attribute “q” will be added twice – for each attribute. To Data Set will be added 4 records.

LN Inst	DO Name	DA Name
1	TapChg	valWTr.posVal
1	TapChg	q
1	TapChg	valWTr.transInd
1	TapChg	q

Figure 123: Adding structure “valWTr” to Data Set of GOOSE Control Block



#### 20.2.11.5 GOOSE External Publisher – Internal Subscriber Side

The application contains up to 16 internal subscribers. They are able to receive GOOSE messages from external GOOSE Publisher. Each subscriber can receive the messages from one Publisher. Each subscriber contains a list of the external data objects, which are included in messages from conformed external publisher. Subscribers and data objects are shown as the logical structure tree on box “GOOSE Light Subscriber Configuration”.

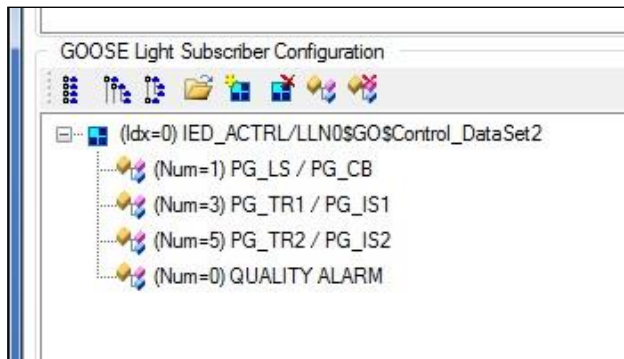


Figure 124: External Publishers List

#### 20.2.11.6 Adding and deleting Subscribers and Data Objects

Use hot-keys and popup menu of the top panel to add new Subscribers and Data Objects or to delete them.

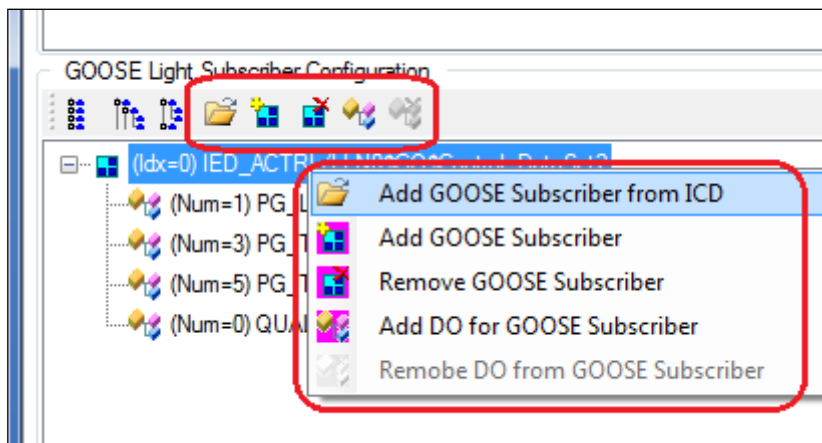


Figure 125: Adding and deleting Subscribers and Data Objects

Communication and GOOSE publisher settings may be got from external ICD. After select this function the new form will be shown. It is need to select ICD-file and GOOSE Control Block from it, to check necessary data objects. Selected control block and data objects will be added as new Subscriber.

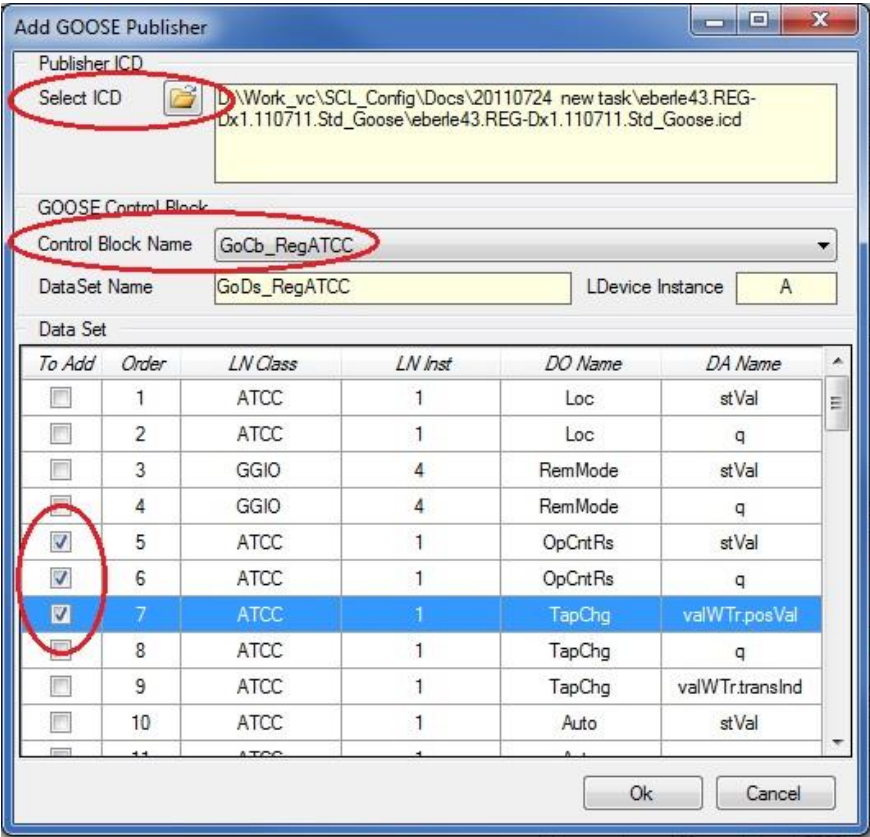


Figure 126: Adding Subscribers and Data Objects from ICD-file

### 20.2.11.7 External Publisher Settings

For selected Subscriber is available settings editor. Logical Devices list contains Logical Devices from ICD of project. If publisher was loaded from external ICD, then GOOSE ID, Control Block and DataSet names, MAC-address will be filled from it.

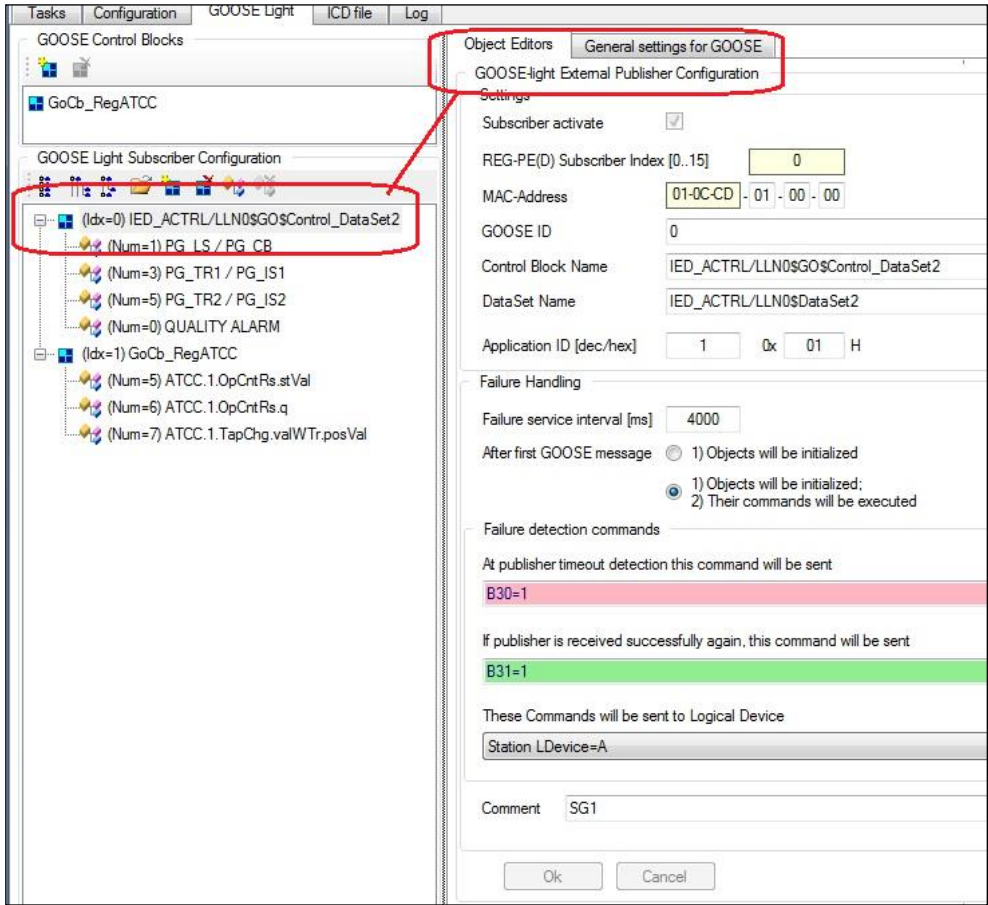


Figure 127: External Publisher Settings

20.2.11.8 External Dataset Object Settings

For selected Data Object is available settings editor. Locked data in form is defined by Subscriber. The behavior of “scale” setting for DoublePoint, Boolean, Quality and other command types is different.

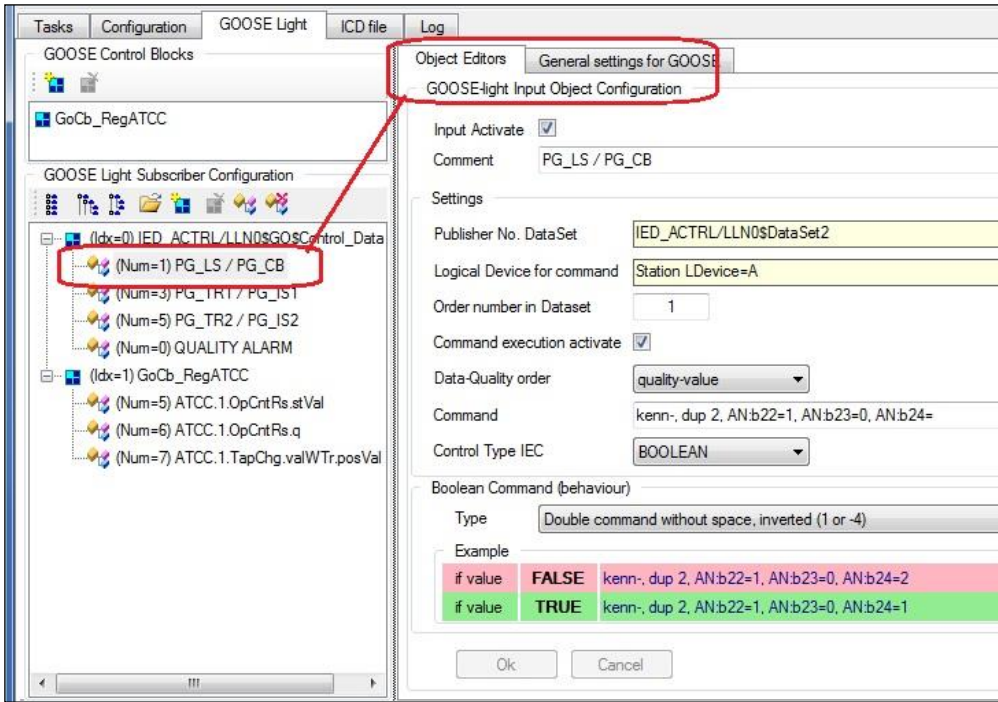


Figure 128: External Dataset Object Settings

### 20.2.12 Actions log

All events open and save files, add and delete nodes, change sAddr stored in the log file and displayed on the page "Log". Log files saved in "Log" application folder.

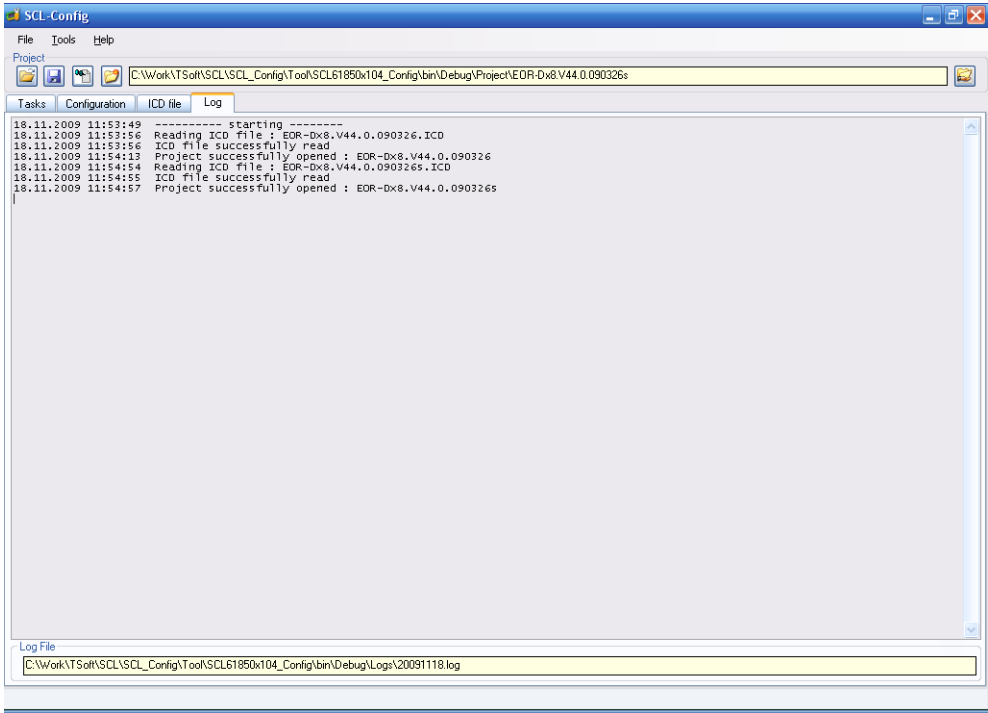


Figure 129: Actions log

### 20.3 IED-Server Configuration

Within IED-Server Configuration, the IED name and the description can be changed. The tree view subentries of the server are directly resolved from the name space of the ICD file. This defines that there may be different names for the logical devices and their subordinated Nodes and their subordinated attributes. That's why only an example can be discussed in the description

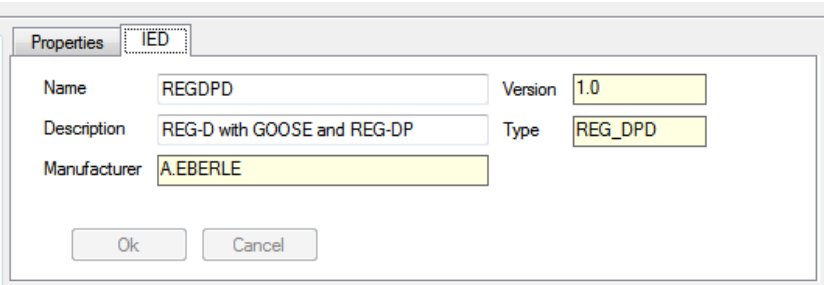


Figure 130: IED Server Description

The length of the IED Name shall be at least one, at maximum 64 characters. It starts with an alpha character, and contains only alphanumeric characters and the underscore character.

Note that there might be more restrictions in other parts of this standard, in IEDs implemented according to previous versions of this standard, or due to usage of this name at engineering time.

### 20.4 Logical Device Configuration

At the moment only the description of the logical device can be changed. Depending on the ICD file, there are normally two logical devices. The numeric part at the end of the instance name results in the instance number. This instance number has to be related to the physical device in the menu “Devices”. To do this, the field “Device relocation” in the menu “Devices” has to have the same numeric value.

### 20.5 Logical Node Configuration

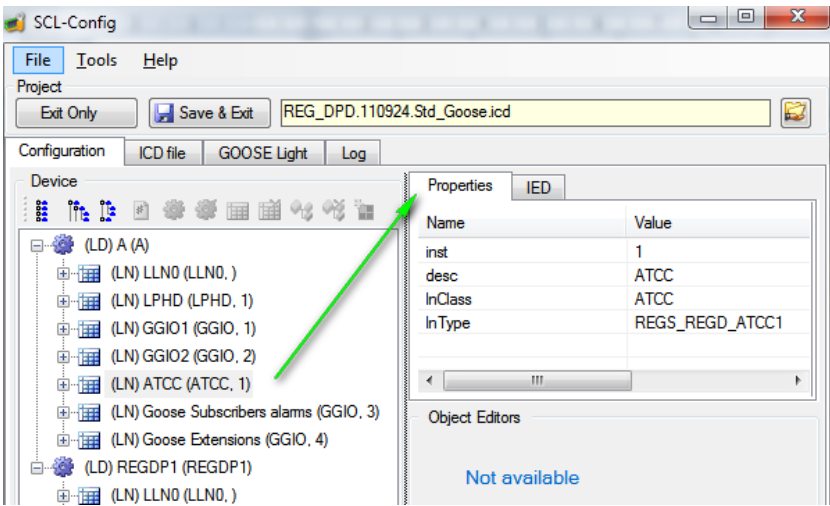


Figure 131: Logical Node Configuration

Typically logical node settings are read only. Depending on the ICD file, all nodes having attributes are shown.

### 20.6 Common Data Attribute Configuration

The data attributes, which can be parameterized, are passed by the ICD file. These attributes have a private data record of type “sAddr” in field of IED DOI. Since this data record it is already default, e.g. an IEC61850 status value or control value can be parameterized.

There is no user support for directly editing the ICD file. That’s why only the interface of the web server is described. Special courses on ICD file editing for engineers are available at a-Eberle on demand.

20.6.1 Status Value Configuration

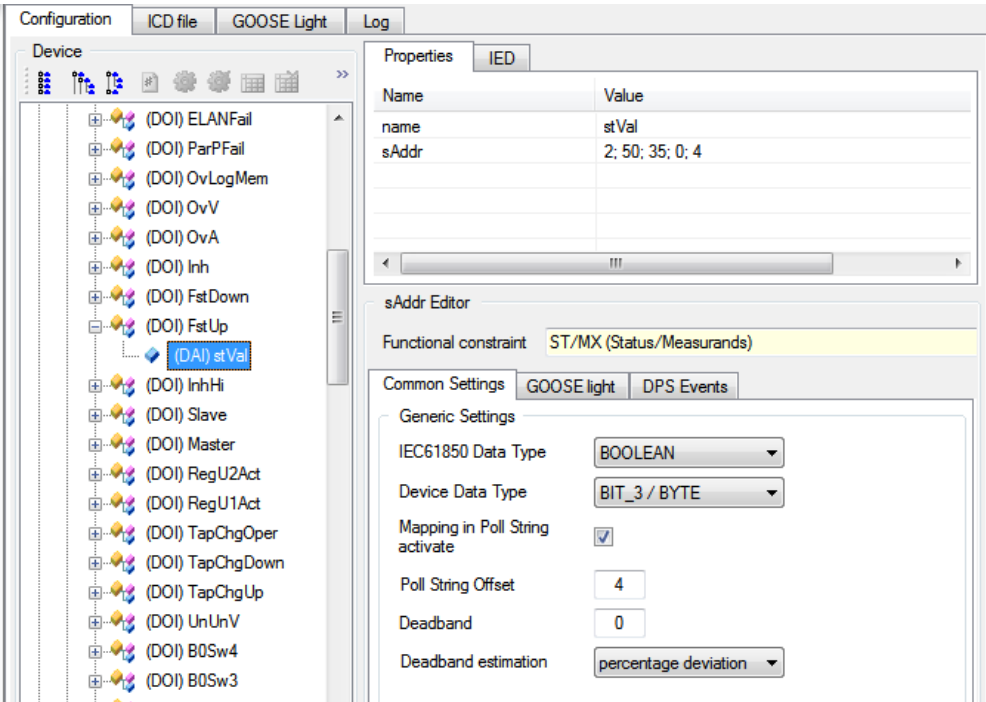


Figure 132: Status Data mapped in device data

IEC-Data point REGD1/LLN0.Mod is not mapped in internal device data (only for example)  
The interface changes versus the setting of “Data mapping in device” set or cleared.  
For example, in REGSys™ documentation displayed OpCntRs data attribute is described as follow:

				OFFSET	IEC 61850 object
REG-D™/DA measured	unit	REG-Data type		RPS 4	LN ATCC1, Attr .mag.f
Common Tap counter	1	double word	96	<b>OpCntRs</b>	

OptCntRs data object is mapped in data of the device and can be imaged in other outside tool or program.

However not mapped *Mod* data attribute is displayed as follows:

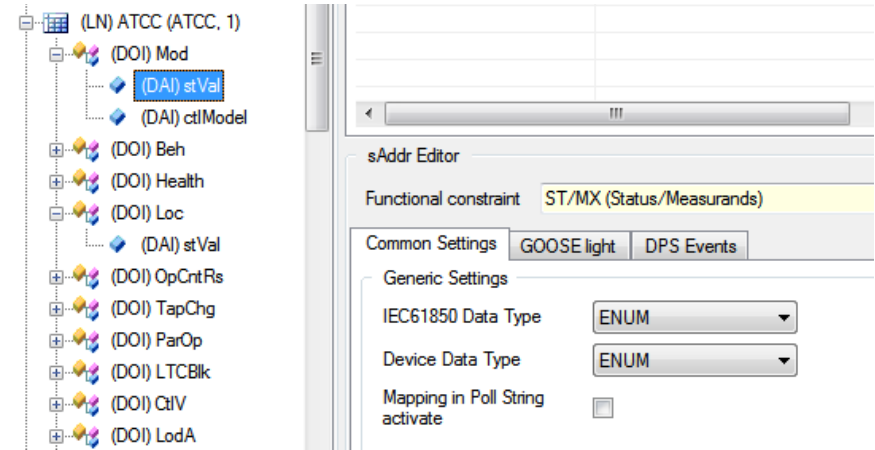


Figure 133: Status Data Point not mapped in device data.

Table 76: Status Data Configuration Data

Form entry	Description
Common	
<i>IEC61850 Data Type:</i>	Defines the corresponding IEC data type.
<i>Mapping in Poll String activate:</i>	The parameter defines the using of data attribute in internal device data. If “No (not mapped in internal data)” has been selected, there is not corresponding offset in internal poll device data.
<b>GOOSElight</b>	
<i>Using as Subscriber timeout-error alarm</i>	The parameter defines the using of data attribute for reporting about timed-out GOOSE telegram, which occurs with waiting timeout expiration.
<i>Number of the observed Subscriber (if set as alarm)</i>	The parameter defines the subscriber index for timeout error reporting
<b>DPS Events</b>	
<i>Auxiliary Group</i>	The parameter defines any auxiliary flag for future using. It is not applicable now
<i>Extended Syntax-Settings</i>	Defines the complex behavior rules and event processing for status object.

20.6.1.1 Extended Lexical Elements Format

To define the complex behavior rules and event processing for status objects there are additional lexical elements, which are used by means of additional extended syntax-settings setting. Any new rule must start with the lexical element.

The character ";" works as a separator between lexical elements. The space character is ignored.

It is necessary to note, that syntactically all language rules are case-insensitive.

**The following is a list of used Lexical elements:**

1. Lexical element \$EVN. It defines data status behavior, if a current event occurs.
2. Lexical element \$CMD. **Not used yet.**

Each Lexical element may be composed of keywords, types and values. The character ":" is a delimiter between the separate keywords, types or values.

**The three possible keyword groups are:**

Table 77: Keyword group for definition the position in poll-string:

Keyword	Description	Values range
Off	offset in poll-string	
Bit	bit-offset begin with offset in poll-string (it is applied only for binary or for Boolean types)	



Table 78: Keyword group for event type definition:

Keyword	Description	Values range
Bool	Boolean or binary type	0,1
Char	Character or signed character type	-128... +127
Byte	Unsigned character type	0.. +255
Unt16	Unsigned two bytes or unsigned short.	0...65535
Word	Signed two bytes or Signed short.	-32768...+32767
ULong	Unsigned four bytes or unsigned long.	0...0xFFFFFFFF
Long	Signed four bytes or signed long.	-0x7FFFFFFF...0x7FFFFFFF
Float	IEEE 754: floating point	bytes

Table 79: Keyword group for definition the directed-behavior in directional protection activation information (ACD)

Keyword	Description	Values range
Back	Backward from IEC61850 enumeration “dir”.	Without value
For	Forward from IEC61850 enumeration “dir”.	Without value
Both	Both from IEC61850 enumeration “dir”.	Without value

Table 80: Keywords group for definition complex data object behavior

Keyword	Description	Values range
Clear	Event clears the status object ( to 0 )	Without value
Set	Event sets the status object ( to one )	Without value
Value	Event sets encapsulated value to the status object	Without value
DpHi	Event answers to the purpose “Higher” in complex DPS data status. It sets anyway its TRUE as [10] by means “any or all gate”	Without value
DpLo	Event answers to the purpose “Lower” in complex DPS data status. It sets anyway its TRUE as [01] by means “any or all gate”	Without value

20.6.1.2 Mapping with Extended Lexical Elements

Here there are some examples shortly of the different ways to use this notification.

- Example: DPS complex status object mapping

Extended syntax-setting is:

**\$Evn:Bool:Off=19:Bit=0:DpHi; \$Evn:Bool:Off=19:Bit=1:DpLo**

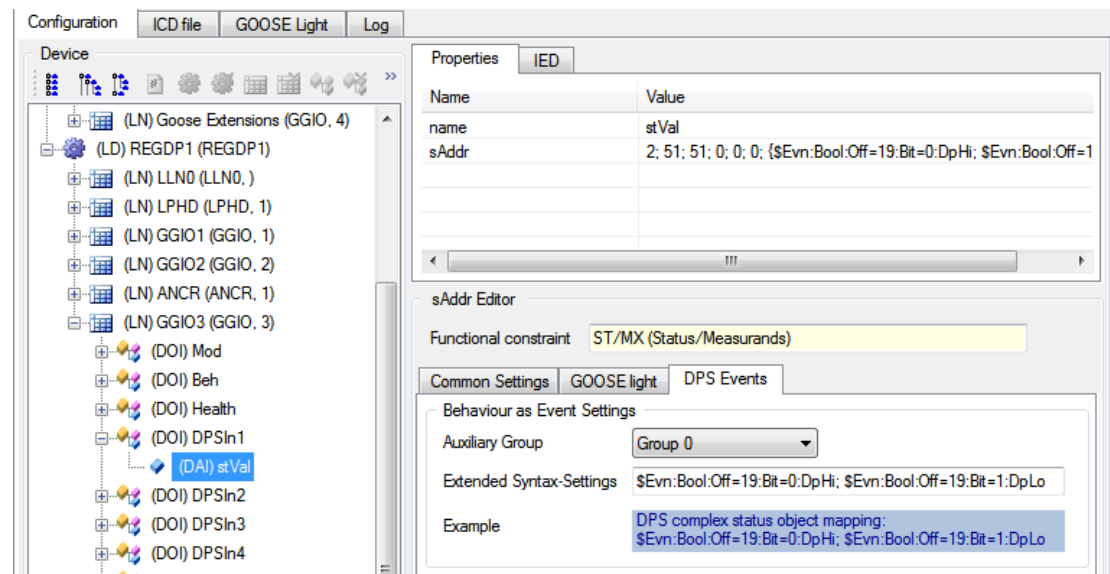


Figure 134: Example of DPS-complex status

- IEC61850 type is “DoublePoint” (enumeration DPos);
- Device internal type is inapplicable, because this status is not mapped in internal data and is not arranged in the poll-string;
- First Event( **\$Evn:Bool:Off=19:Bit=0:DpHi** ) defines internal SPS-data: offset 19, bit offset 0. Its behavior fits with DPS-Higher request. If this SPS (status point) is set to TRUE, value [10] will be set by means “any or all gate” after clear of high byte. If this SPS (status point) is set to FALSE, high bit will be cleared.
- Second Event( **\$Evn:Bool:Off=19:Bit=1:DpLo** ) defines internal SPS-data: offset 19, bit offset 1. Its behavior fits with DPS-Lower request. If this SPS (status point) is set to TRUE, value [01] will be set by means “any or all gate” after clear of lower bit. If this SPS (status point) is set to FALSE, low bit will be cleared.

- Example: Status object by means directional protection activation

Extended syntax-setting is:

**\$Evn:Bool:Off=19:Bit=0:Forw; \$Evn:Bool:Off=19:Bit=1:Back; \$Evn:Bool:Off=19:Bit=3:Both**

- IEC61850 type is “DoublePoint” (enumeration “dir”);
 

```

      <EnumType id="dir">
        <EnumVal ord="0">unknown</EnumVal>
        <EnumVal ord="1">forward</EnumVal>
        <EnumVal ord="2">backward</EnumVal>
        <EnumVal ord="3">both</EnumVal>
      </EnumType>
      
```

- Device internal type is inapplicable, because this status is not mapped in internal data and is not arranged in the poll-string;

- First Event( **\$Evn:Bool:Off=19:Bit=0:Forw** ) defines internal SPS-data event: offset 19, bit offset 0. Its behavior fits with Dir-enumeration type in IEC61850. If this SPS (status point) is set to TRUE, value 1 will be set. Value FALSE ignored.
- Second Event( **\$Evn:Bool:Off=19:Bit=1:Back** ) defines internal SPS-data event: offset 19, bit offset 1. Its behavior fits with Dir-enumeration type in IEC61850. If this SPS (status point) is set to TRUE, value 2 will be set. Value FALSE ignored.
- Third Event( **\$Evn:Bool:Off=19:Bit=2:Both** ) defines internal SPS-data event: offset 19, bit offset 2. Its behavior fits with Dir-enumeration type in IEC61850. If this SPS (status point) is set to TRUE, value 3 will be set. Value FALSE ignored.
- Example: Triggered status object

Extended syntax-setting is:

**\$Evn:Bool:Off=19:Bit=0:Set; \$Evn:Bool:Off=19:Bit=1:Clear**

- IEC61850 type is BOOLEAN
- Device internal type is inapplicable, because this status is not mapped in internal data and is not arranged in the poll-string;
- First Event( **\$Evn:Bool:Off=19:Bit=0:Set** ) defines internal SPS-data event: offset 19, bit offset 0. If this SPS (status point) is set to TRUE, value 1 will be set. Value FALSE ignored.
- Second Event( **\$Evn:Bool:Off=19:Bit=1:Clear** ) defines internal SPS-data event: offset 19, bit offset 0. If this SPS (status point) is set to TRUE, value 0 will be set. Value FALSE ignored.

## 20.6.2 Control Value Configuration

The operate request is performed through the use of a **Write.request** of the appropriate **Oper** structure.

The Oper\$ctlVal settings and executing behavior are defined in “Control Value Configuration” section.

The parameter Oper\$Check specifies the kind of checks a control object and is defined only in ICD file. All conditional tests before and after the control operations are adjustable and defined below.

20.6.2.1 Single Command

Here “Multi-Command” is not checked. If it is checked, the mode will be changed to “Multi Command”.

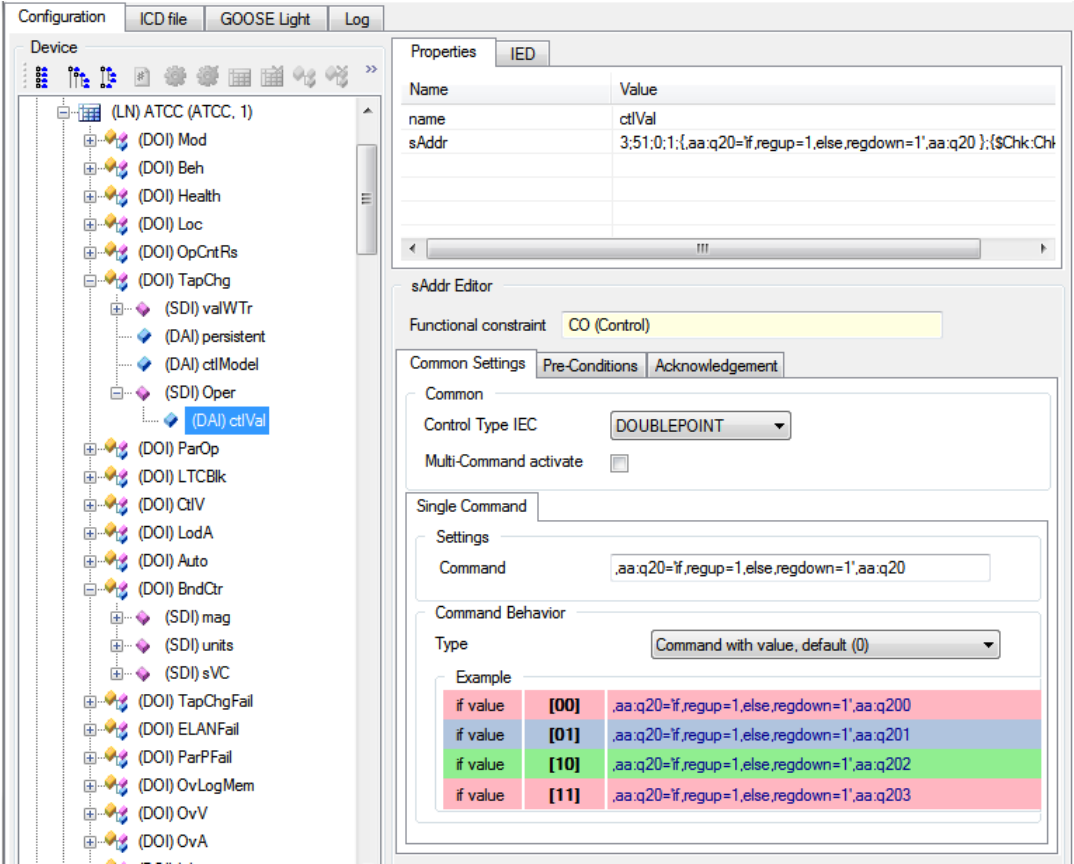
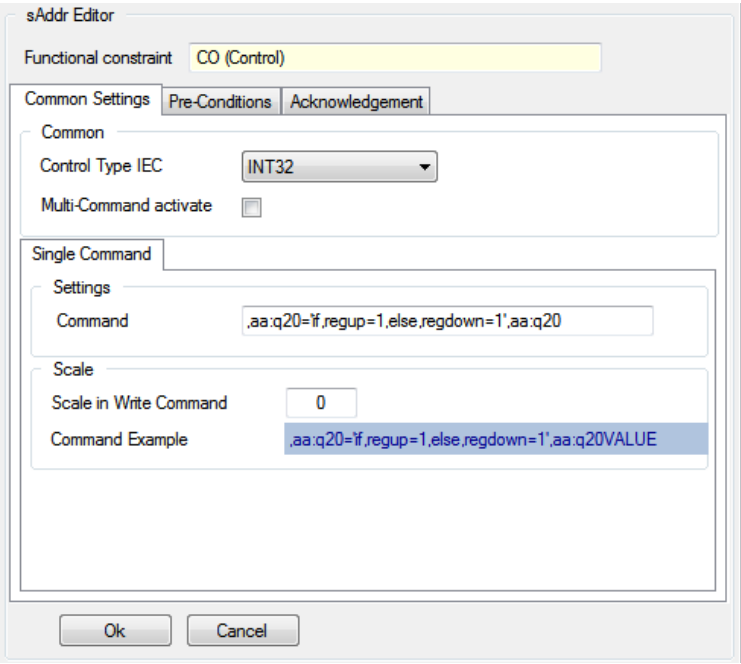


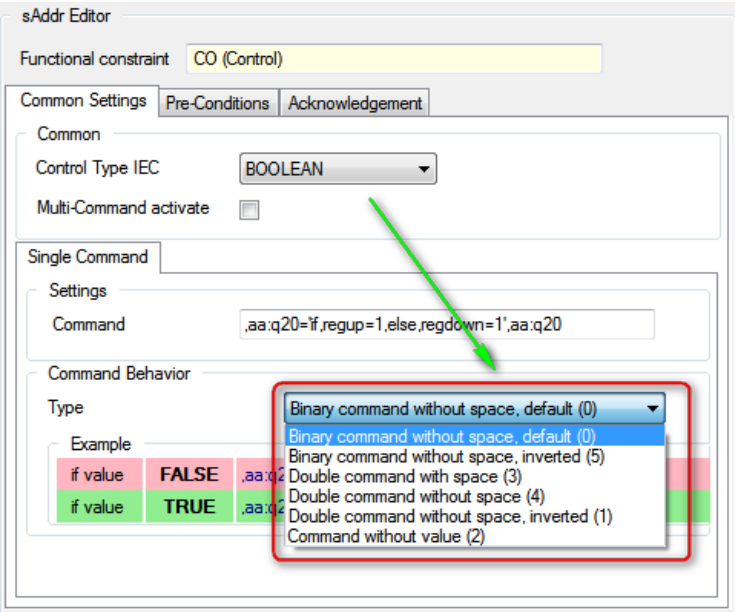
Figure 135: Control Value Configuration (Single Command)

Table 81: Control value settings

Form entry	Description
Common	
Control Type IEC	Defines the corresponding IEC control data type.
Multi-command	The parameter defines using of the multi command CO-data attribute. Leave unchecked for single command
Single command	
Field Section “XXXX-Command”	Normally, this parameter is used as exponent with single commands. If a Boolean or DoublePoint IEC control data type is used, scale has special meaning. (See below)  The parameter can be adjusted from -127...128. By default set to 0.

Form entry	Description
	<p>Command</p> <p>Defines the command string, which is assigned with converted IEC control value of scale rule. The result is sent to XXXSysTM – device.</p>

If IEC-Type of command is BOOLEAN, scale parameter will be used as shown below:



if value	FALSE	.aa;q20=if,regup=1,else,regdown=1';aa;q20
if value	TRUE	.aa;q20=if,regup=1,else,regdown=1';aa;q20

Table 82: Boolean conversion rules for [command] [convert (ct/Val)]

Scale	IEC Value	Conversion
1	False	[command][2]
1	True	[command][1]

Command Behavior

TypeDouble command without space, inverted (1)

Example

if value	FALSE	,aa:q20=if,regup=1,else,regdown=1',aa:q202
if value	TRUE	,aa:q20=if,regup=1,else,regdown=1',aa:q201

2	False/True	[command]
---	------------	-----------

Settings

Command,aa:q20=if,regup=1,else,regdown=1',aa:q20

Command Behavior

TypeCommand without value (2)

Example

if value	FALSE	,aa:q20=if,regup=1,else,regdown=1',aa:q20
if value	TRUE	,aa:q20=if,regup=1,else,regdown=1',aa:q20

3	False	[command][space][1]
3	True	[command][space][2]

Single Command

Settings

Command,aa:q20=if,regup=1,else,regdown=1',aa:q20

Command Behavior

TypeDouble command with space (3)

Example

if value	FALSE	,aa:q20=if,regup=1,else,regdown=1',aa:q20 1
if value	TRUE	,aa:q20=if,regup=1,else,regdown=1',aa:q20 2

Scale	IEC Value	Conversion
4	True	[command][2]
4	False	[command][1]

Single Command

Settings

Command

Command Behavior

Type

Example

if value	FALSE	,aa:q20=if,regup=1,else,regdown=1',aa:q20
if value	TRUE	,aa:q20=if,regup=1,else,regdown=1',aa:q202

5	False	[command][1]
5	True	[command][0]

Single Command

Settings

Command

Command Behavior

Type

Example

if value	FALSE	,aa:q20=if,regup=1,else,regdown=1',aa:q201
if value	TRUE	,aa:q20=if,regup=1,else,regdown=1',aa:q200

Scale	IEC Value	Conversion
Default 0	False	[command][0]
Default 0	True	[command][1]

Single Command

Settings

Command

.aa:q20=if,regup=1,else,regdown=1',aa:q20

Command Behavior

Type

Binary command without space, default (0)

Example

if value	FALSE	.aa:q20=if,regup=1,else,regdown=1',aa:q20
if value	TRUE	.aa:q20=if,regup=1,else,regdown=1',aa:q20

If IEC-Type of command is DOUBLEPOINT, scale parameter will be used as shown below:

Common Settings

Pre-Conditions

Acknowledgement

Common

Control Type IEC

DOUBLEPOINT

Multi-Command activate

Single Command

Settings

Command

.aa:q20=if,regup=1,else,regdown=1',aa:q20

Command Behavior

Type

Command with value, default (0)

Command with value, default (0)

Binary command with value [1|2] (1)

Binary command with value, inverted [2|1] (4)

Double command with value [0|1|2] (2)

Double command with value [0|1|2|3] (3)

Double command with value, inverted [2|1] (5)

Example

if value	[00]	.aa:q20=if,regup=1,else,regdown=1',aa:q20
if value	[01]	.aa:q20=if,regup=1,else,regdown=1',aa:q20
if value	[10]	.aa:q20=if,regup=1,else,regdown=1',aa:q20
if value	[11]	.aa:q20=if,regup=1,else,regdown=1',aa:q20



Table 83: Double Point conversion rules for [command][convert(ctlVal)]

Scale	IEC Value	Conversion
1	[00]	Negative response.
1	[01]	[command][0]
1	[10]	[command][1]
1	[11]	Negative response.
2	[00]	[command][0]
2	[01]	[command][1]
2	[10]	[command][2]
2	[11]	Negative response.
3 ( unused value. Instead of this a default value is used)	[00]	[command][0]
	[01]	[command][1]
	[10]	[command][2]
	[11]	[command][3]
4	[00]	Negative response.
4	[01]	[command][1]
4	[10]	[command][0]
4	[11]	Negative response.
5	[00]	Negative response.
5	[01]	[command][2]
5	[10]	[command][1]
5	[11]	Negative response.
Default	value	[command][value]

20.6.2.2 Multi Command

Here the check box for “Multi-command” is checked. If it gets unchecked, the mode will be changed to “Single Command”.

This mode is only available for Boolean and DoublePoint commands.



**Multi-command mode has been left for backward compatibility and will not be supported in future.**

Common Settings

Pre-Conditions

Acknowledgement

Common

Control Type IEC

BOOLEAN

Multi-Command activate

☒

Multi Command

Number of Commands

2

Command No.1

Scale

0

Command

,aa:q20=if,regup=1,else,regdown=1',aa:q20

Command No.2

Scale

0

Command

Command2=

Command No.3

Scale

0

Command

Command No.4

Scale

0

Command

Figure 136: Control Value Configurations (Multi Command)

Multi commands are built, as a chain of the comma-separated commands. For example, commands No.1 and No.2 create the multi-command:

**A: regAUTO=1, ,aa:q20='if,regup=1,else,regdown=1', aa:q20'**

Table 84: Multi command control value settings

Form entry	Description
Common	
<i>IEC-type of control</i>	Defines the corresponding IEC control data type.
<i>Multi-Command activate</i>	The parameter defines using of the multi command CO-data attribute. Leave unchecked for single command
Single command	
<i>Scale</i>	Normally, scale is used as exponent with single commands. If a Boolean/Double IEC control data type is selected, scale has special meaning. (See following tables.) The parameter can be adjusted from -127...128. By default set to 0.
<i>Command</i>	Defines the command string, which is assigned with converted IEC control value of scale rule. The result is sent to XXXSys™ – device.

### 20.6.2.3 Pre-Conditions

Command pre-conditions define the behavior of check before the control operation.  
They are checked each time before control operation.

The screenshot shows a software interface with three tabs: 'Common Settings', 'Pre-Conditions', and 'Acknowledgement'. The 'Pre-Conditions' tab is active, showing three sub-tabs: 'Condition No.1', 'Condition No.2', and 'Condition No.3'. Under 'Condition No.1', there is a dropdown menu set to 'Same as Checked Value'. Below this is an 'Extended Settings' section with several fields: 'Checked Data Point Type' (dropdown set to 'BIT\_7 / BYTE'), 'Poll String Offset' (text box with '3'), 'Checked Value (optional)' (text box with '1'), 'Minimal Position (optional)' (text box with '0'), 'Maximal Position (optional)' (text box with '0'), 'Allowed Command Value to leave minimal Position' (text box with '0'), 'Allowed Command Value to leave maximal Position' (text box with '0'), and 'Additional Cause Diagnosis (IEC61850-8.1 AddCause)' (dropdown set to 'Blocked-by-Mode').

Figure 137: Executing Command Pre-Conditions

- If predictable condition check finished successful, control operation continues and command will be sent to device.
- If predictable condition check faulted, application sends “response-“ and an information report with Last Error cod to client according to a selected control model in ICD file.

Even if a part of checks finished successful, command will be never sent, if at least one condition faulted.

Selector “Condition” defines a predictable type by mean of test-behavior.

This screenshot shows the 'Condition Type (behavior)' dropdown menu from the previous figure. The menu is open, displaying several options: 'Same as Checked Value' (selected), 'disable', 'Same as Command Value', 'Other than Command Value', 'Same as Checked Value' (highlighted in blue), 'Other than Checked Value', 'Within Limits', and 'Outside Limits'. The background shows the same 'Pre-Conditions' configuration window as in Figure 137.

Figure 138: Condition Type (behavior)

Extended Settings define test behavior and data point, which will be checked. The maximal and minimal limit position can be defined too.

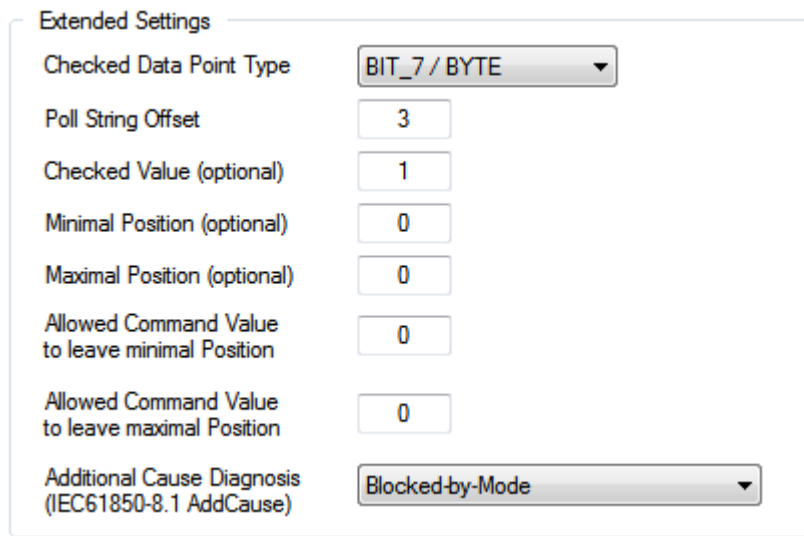


Figure 139: Condition extended Settings

Table 85: Predicable Condition Extended Settings

Form entry	Description
Checked data Point Type	Defines a checked Data Point type in Poll string.
Poll String Offset	Defines a checked Data Point Poll string offset.
Checked Value(optional)	Defines a checked value as FLOAT32 value
Minimal Position (optional)	Defines minimal position by "Limit condition"
Maximal Position (optional)	Defines maximal position by "Limit condition"
Allowed Command Value to leave minimal Position	Defines command value, that permitted at minimal position by "Limit condition"
Allowed Command Value to leave maximal Position	Defines command value, that permitted at maximal position by "Limit condition"

20.6.2.4 Command Acknowledgement

Command Acknowledgement condition defines a check behavior after command executing.

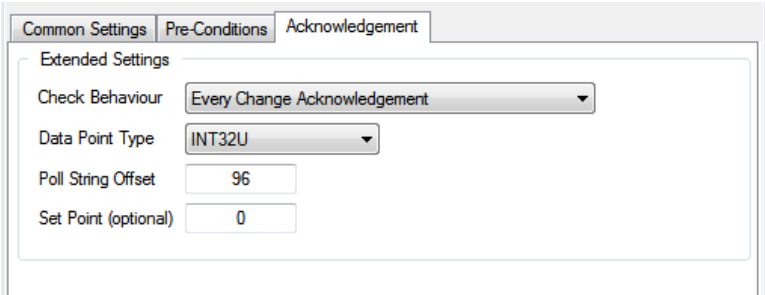


Figure 140: Acknowledgement Condition Settings

Form entry	Description
Check Behavior	Defines the estimation behavior
Data Point Type	Defines test data point type in poll string
Poll String Offset	Defines test data point offset in poll string
Set Point (optional)	Optional defines the test value. For example 0 for reset command.

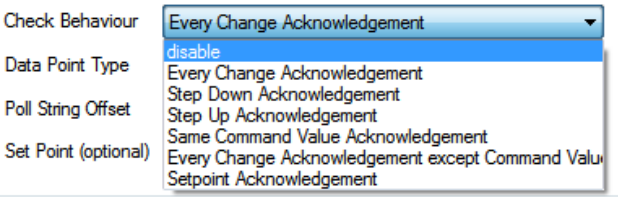


Figure 141: ACK-NACK test behavior

The check behaviors are same as in predicable condition. However, there is “Setpoints..” condition, which literal meaning same with name.

20.6.2.5 Control Model

Parameter ctlModel specifies the control model of IEC 61850-7-2 that corresponds to the behavior of the data. The configured value for ctlModel becomes effective as soon as the real device has been configured. The values may be overwritten in Webserver if the conditions and acknowledgment allow overwriting this value. If a data instance of a control class has no status information associated, then the attribute stVal does not exist. In that case, the value range for ctlModel is restricted to direct-with-normal-security and sbo-with-normal-security.

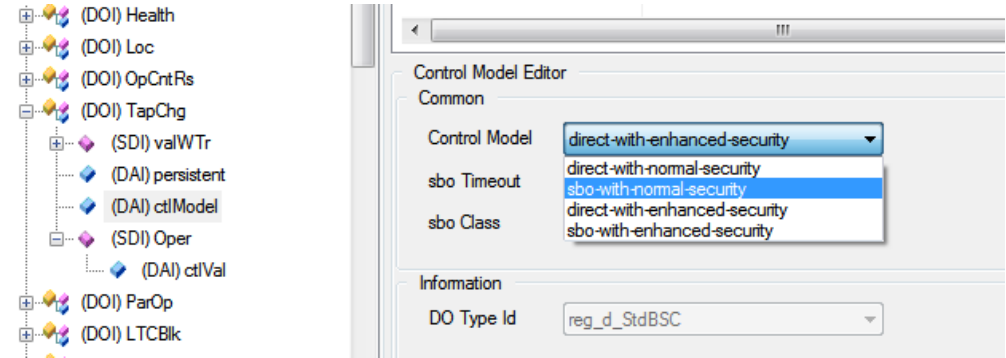


Figure 142: Control Model Parameter

20.6.3 Set point Value Configuration (Single Command)

Set point values are to be configured as a mixed form of a status value and a command. Here the check box “Multi Line” is not checked. If it gets checked, the mode will be changed to “Multi Command”.

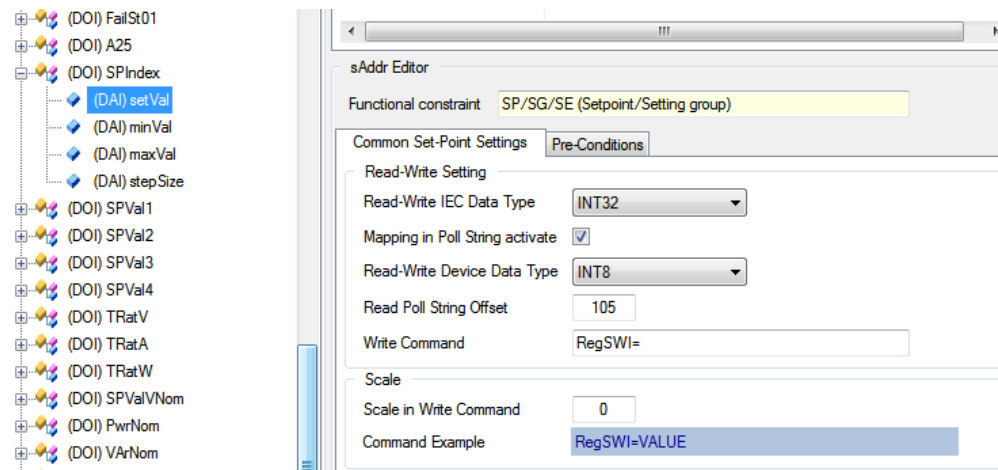


Figure 143: Set point Value Configuration (only with Single Command)

Table 86: Single command Set point settings

Form entry	Description
Common (Status and Measured)	
<i>Read-Write IEC Data Type</i>	Defines the corresponding IEC control data type.
<i>Mapping in Poll String activate:</i>	The parameter defines using this data attribute in internal device data. If “No (not mapped in internal data)” has been selected, there is not corresponding offset in internal poll device data.
<i>Read-Write Device Data Type:</i>	Defines the corresponding XXXSysTM – device data type. If “IGNORE” is selected or “Deviation and offset are used” is not checked, this data point is not allocated. Device data type determines the interpretation of “Deviation”
<i>Read Poll String Offset</i>	Defines offset of the device answer string, where this data is located. If -1, the data point will not be mapped to the answer string. The parameter can be adjusted from -1...255. By default it is -1.
<i>Scale in Write Command</i>	Normally, scale is used as exponent with single commands. If a Boolean IEC control data type is selected, scale has special meaning. (See following tables.) The parameter can be adjusted from -127...128. By default set to 0.
<i>Write Command:</i>	Defines the command string, which is assigned with converted IEC control value of scale rule. The result is sent to XXXSysTM – device.
GOOSE light	
<i>Subscriber Number ( if activated ):</i>	The parameter defines any auxiliary flag for future using. It is not applicable now.
Pre-Conditions	
<i>Checked data Point Type</i>	Defines a checked Data Point type in Poll string.
<i>Poll String Offset</i>	Defines a checked Data Point Poll string offset.
<i>Checked Value(optional)</i>	Defines a checked value as FLOAT32 value
<i>Minimal Position (optional)</i>	Defines minimal position by “Limit condition”
<i>Maximal Position (optional)</i>	Defines maximal position by “Limit condition”
<i>Allowed Command Value to leave minimal Position</i>	Defines command value, that permitted at minimal position by “Limit condition”
<i>Allowed Command Value to leave maximal Position</i>	Defines command value, that permitted at maximal position by “Limit condition”

## 20.7 GOOSE *light* Settings

### 20.7.1 IEC GOOSE *light* Architecture

The implementation of the IEC 61850 GOOSE services provides a mechanism for sending and receiving the standardized GOOSE telegrams. The settings and architectures are quite similar for publisher and subscribers.

It is assumed that the reader is familiar with the GOOSE *light* architecture.

### 20.7.2 GOOSE *light* Control Blocks Settings

```
<Communication>
  <SubNetwork name="SUBNETWORK1" type="8-MMS">
    <BitRate unit="b/s">100</BitRate>
    <ConnectedAP idName="REGDA" apName="P1">
      <Address>
        <P type="OSI-PSEL">00000001</P>
        <P type="OSI-SSEL">0001</P>
        <P type="OSI-TSEL">0001</P>
      </Address>
      <GSE idInst="A" cbName="GoCb_Bin">
        <Address>
          <P type="MAC-Address" xsi:type="tP_MAC-Address">01-0C-CD-01-01-01</P>
          <P type="APPID">1</P>
          <P type="VLAN-PRIORITY">4</P>
          <P type="VLAN-ID">000</P>
        </Address>
        <MinTime unit="s" multiplier="m">10</MinTime>
        <MaxTime unit="s" multiplier="m">1000</MaxTime>
      </GSE>
      <GSE idInst="A" cbName="GoCb_State">
        <Address>
          <P type="MAC-Address" xsi:type="tP_MAC-Address">01-0C-CD-01-01-0A</P>
          <P type="APPID">1</P>
          <P type="VLAN-PRIORITY">4</P>
          <P type="VLAN-ID">000</P>
        </Address>
        <MinTime unit="s" multiplier="m">10</MinTime>
        <MaxTime unit="s" multiplier="m">1000</MaxTime>
      </GSE>
      <PhysConn type="Plug">
        <P type="Type">FOC</P>
        <P type="Plug">SI</P>
      </PhysConn>
    </ConnectedAP>
  </SubNetwork>
</Communication>
```

Figure 144: GOOSE *light* Control Blocks Configuration

In this case, application transmits data from GoDsUI dataset in Goose Output telegrams.

The content of a GOOSE *light* message is defined with a dataset. The GOOSE *light* message is sent as multicast messages over the communication network.

**One example of SCL configuration shown below:**

```
<ConnectedAP IedName="REGD159" apName="P1">
  <GSE IdInst="REGD1" cbName="GoCbUI_REGD1">
    <Address>
      <P type="MAC-Address" xsi:type="tP_MAC-Address">01-0C-CD-01-00-00</P>
      <P type="APPID">0BB8</P>
      <P type="VLAN-PRIORITY">4</P>
      <P type="VLAN-ID">000</P>
    </Address>
    <MinTime unit="s" multiplier="m">10</MinTime>
    <MaxTime unit="s" multiplier="m">1000</MaxTime>
  </GSE>
</ConnectedAP>
```

**The captured fragment of the GOOSE *light* output telegram illustrated below.**

```
IEC 61850 GOOSE
AppID*: 1
PDU Length*: 221
Reserved1*: 0x0000
Reserved2*: 0x0000
PDU
IEC GOOSE
{
  Control Block Reference*: REGDAA/LLN0$Go$GoCb_State
  Time Allowed to Live (msec): 8000
  DataSetReference*: REGDAA/LLN0$GoDs_State
  GOOSEID*: GoId_State
  Event Timestamp: 1984-01-01 00:00.42,528008 Timequality: 00
  StateNumber*: 1
  SequenceNumber*: Sequence Number: 429
  Test*: FALSE
  Config Revision*: 1
  Needs Commissioning*: FALSE
  Number Dataset Entries: 27
  Data
  {
    BOOLEAN: FALSE
    BITSTRING:
      BITS 0000 - 0015: 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
    BOOLEAN: FALSE
    BITSTRING:
      BITS 0000 - 0015: 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
    INTEGER: 0
    BITSTRING:
      BITS 0000 - 0015: 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
    INTEGER: 0
    BITSTRING:
      BITS 0000 - 0015: 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
    BOOLEAN: FALSE
    BOOLEAN: FALSE
    BITSTRING:
      BITS 0000 - 0015: 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
```

Figure 145: Capture fragment of GOOSE *light* telegram



### 20.7.3 GOOSE *light* Input Streams (Inner Subscribers)

The application allows the configuration of up to 15 GOOSE *light* input streams.  
The architecture of GOOSE *light* subscribing is shown in **Fehler! Verweisquelle konnte nicht gefunden werden..**

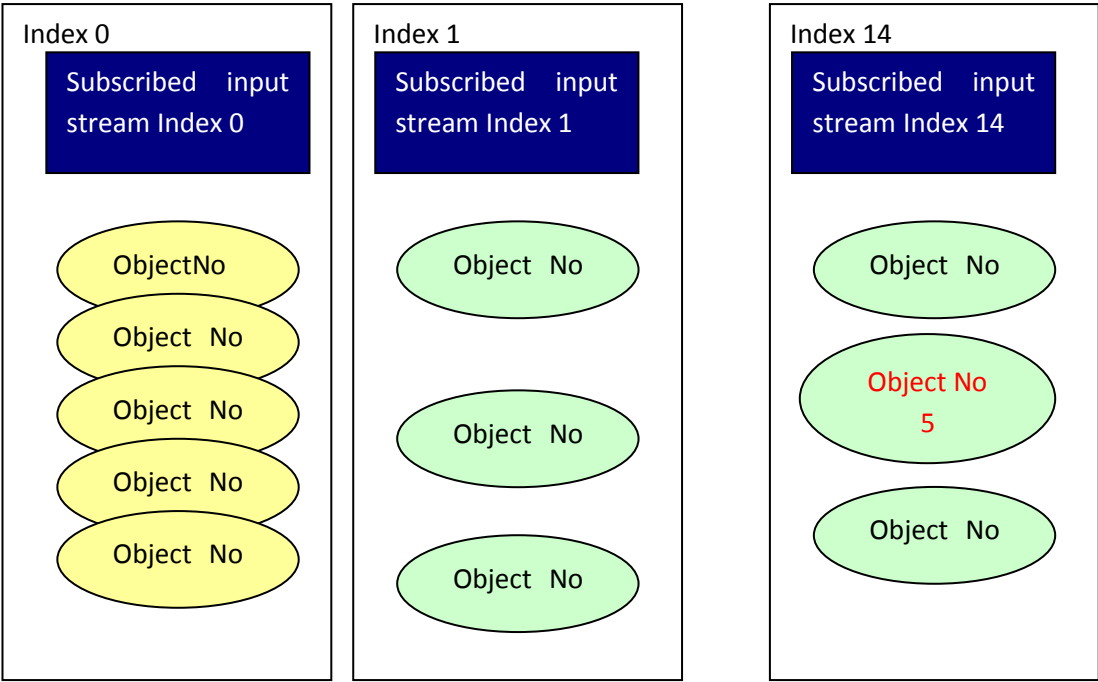
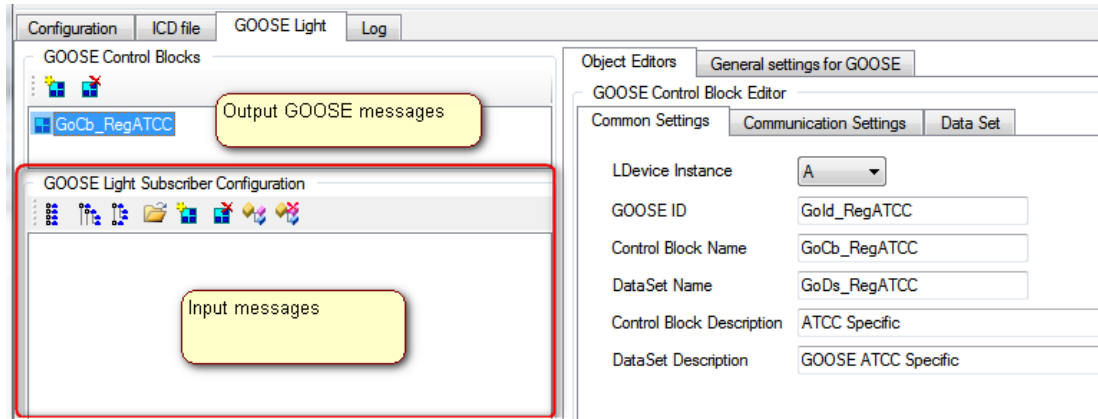


Figure 146: GOOSE *light* Input architecture

Each subscriber holds one set of objects in sequence order. Each object of the subscribed set is given a particular number in received GOOSE *light* telegram. If the subscriber has not been configured in numerical order, its input telegrams cannot be handled in an application. More detailed information is available below.

### 20.7.4 Publisher Side

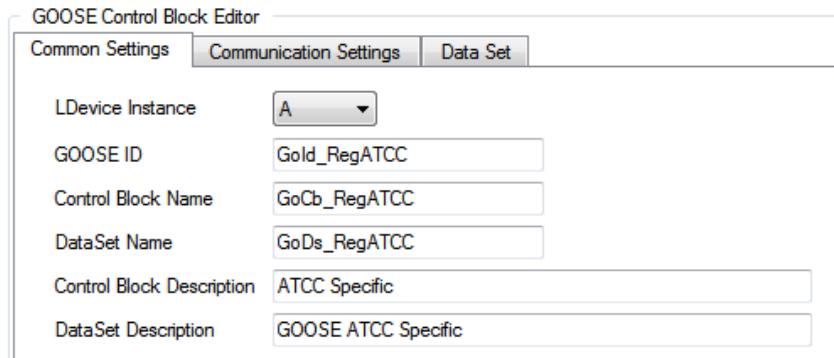
The current paragraph illustrates the generic Object Oriented Substation Event configuration within the MMS server and SCL which defined in ICD file in your settings.  
The GOOSE *light* configuration database contains settings with the following data elements:



*Figure 147: Publisher and Subscriber sides*

Adjusted GOOSE settings will be saved to file `goose.param`. At the same time an ICD-file contains the factory GOOSE settings. You should also take that into account.

All changed parameters are available only after resetting the REG-PE/REG-PED.



The screenshot shows the 'GOOSE Control Block Editor' window with three tabs: 'Common Settings', 'Communication Settings', and 'Data Set'. The 'Common Settings' tab is active. It contains the following fields:

Field	Value
LDevice Instance	A
GOOSE ID	Gold_RegATCC
Control Block Name	GoCb_RegATCC
DataSet Name	GoDs_RegATCC
Control Block Description	ATCC Specific
DataSet Description	GOOSE ATCC Specific

*Figure 148: "Common Options" Tab*

There are two Timing strategy types: arithmetic and profile.

The arithmetic scheme has three parameters: first interval, multiplier, and maximum interval. The first retransmission occurs after the first interval time. Each subsequent interval is the product of the last interval times the multiplier, until the maximum interval is reached. Thus, for first interval = 400, multiplier = 2, and maximum interval = 3200, the retransmissions will occur at intervals beginning at 2, and doubling each time until the maximum interval is reached (400, 800, 1600, 3200). If any changes of GOOSE data occur the application immediately sends GOOSE data and then resets the retransmission time to interval to first interval.

The profile scheme allows for a specific set of intervals to be specified. Each interval (specified in milliseconds) is used in sequence of GOOSE *light* telegrams. When the last specified interval has been used, the parameters of the arithmetic scheme are then used for subsequent intervals (including the maximum retransmission interval).

If any changes of GOOSE *light* data occur, the application immediately sends GOOSE data and then resets the retransmission time to interval to first interval.

Terminal, Autoloading

GSE GOOSE activate

GSE Control Blocks adjustment activate

Retransmission Strategy

Default Step Delay [ms]

Retransmission Strategy Type

Arithmetic scheme

First interval [ms]

Multiplier

Max retransmission timeout [ms]

Profile scheme

Number of Intervals

1th interval [ms]

2th interval [ms]

3th interval [ms]

4th interval [ms]

5th interval [ms]


6th interval [ms]




Figure 149: GOOSE Retransmission Settings Tab


Firmware supports up to 4 Control Blocks. Their number is defined of ICD Communication Section. For example, if an ICD file contains the 3 GOOSE GSEs, only these GOOSE Control blocks will be shown here.

The settings data elements are described in the table below.

Table 87: Settings of GOOSE light

Name	Unit	Range	Standard value	Description
Common				
GSE GOOSE activate	Used/ Not used		Used	<div>Parameter activates/deactivates IEC GOOSE service. If GOOSE will be not used, the service will be deactivated. It can reduce a network busy schedule.</div> <div><div></div><div>Setting “No” switches off all GOOSE services.</div></div>
GSE Control Blocks ad-justment activate	Y/N	Yes/ No (use only MMS-Goose Control Blocks)	No	<div>Parameter activates/deactivates an adjustment of the published IEC GOOSE Control Blocks, which have been described in the ICD file. If “No” is selected, REG-PE/REG-PED publishes all GOOSE Control Blocks as this has been described in ICD-file.</div> <div><b>If the adjustment has been deactivated, all following APPID and VLAN settings will be not applied.</b></div>

Name	Unit	Range	Standard value	Description
MAC Address (destination of GOOSE messages)	hex	6 octet	IEC61850-8	Parameter defines the multicast data link destination address for a first IEC GOOSE Control Block from GSE-Section in ICD file.
Application ID	Hex/dec	From 0 up to 2 <sup>32</sup>	0x3ED or 1001 in decimal notation	The parameter defines VLAN APPLD which identifies a using the VLAN (802.1q) for a first IEC GOOSE Control Block from GSE-Section in ICD file. For detailed information see please IEC61850-8-1
VLAN ID	Hex/dec	From 0 up to 2 <sup>32</sup>	0	The parameter defines the unique identified of VLAN ID (802.1q) 0 - indicates that the tag header contains only user priority information, no VLAN ID. 1 - Default PVID value used for classifying frames on ingress through a bridge port. FFF - Reserved for implementation use.
VLAN Priority	dec	From 0 up to 7	4	The parameter defines the VLAN Priority as 3-bit binary number representing 8 priority levels, 0-7 (802.1q).
<b>GOOSE Retransmission Strategy</b>				
Default Step Delay	ms	0...65535	500	Parameter defines minimal timeout for IEC Goose service. Service function checks all changes in a poll of the Goose published Data Points and activates Goose transmission in any case. It activates retransmission even if the settings of retransmission strategies are not set.
Retransmission Strategy Type	list	<div> <div>geometric</div> <div>disable</div> <div>geometric profile</div> </div>	geometric (other name is arithmetic)	Selection of the Goose strategy type: arithmetic and profile.   “Disabled” option enables the application to send new GOOSE telegrams after changes or by expiring default step delay timeout.
First interval:	ms	0... up to 65535	1000	The parameter defines the first interval in milliseconds in arithmetic retransmission scheme.   Zero will be ignored and the application sets default value 1000 ms.
Multiple (arithmetic)	dec	0... up to 255	2	The setting defines the multiplier the for <b>arithmetic</b> retransmission scheme.   Zero will be ignored and the application sets default value 2.

Name	Unit	Range	Standard value	Description
Max Interval (arithmetic)	ms	0... up to 65535	4000	<p>The setting defines the maximal interval in milliseconds in <b>arithmetic</b> retransmission scheme.</p> <div> Zero will be ignored and the application sets default value 4000 ms.</div>
Number of Intervals	dec	up to 6	6	The setting defines a number of intervals in the <b>profile</b> retransmission scheme
Interval timeouts	dec	Up to 255	1000 1500 2000 2500 3000 4000	The intervals in milliseconds in profile retransmission schema. If any changes of Goose data occur, the application sends Goose data and then resets the retransmission time to value of first interval.

## 20.7.5 Subscribe Side

### 20.7.5.1 List of GOOSE light External Publishers

The application allows subscribing from 1 up to 16 external publishers as GOOSE partners for REG-PE / REG-PED. The external GOOSE *light* publishers are complying with a specification of REG-PE / REG-PED inner Subscribers.

**The GOOSE *light* Subscribers List pane contains full information about the subscribed GOOSE streams:**

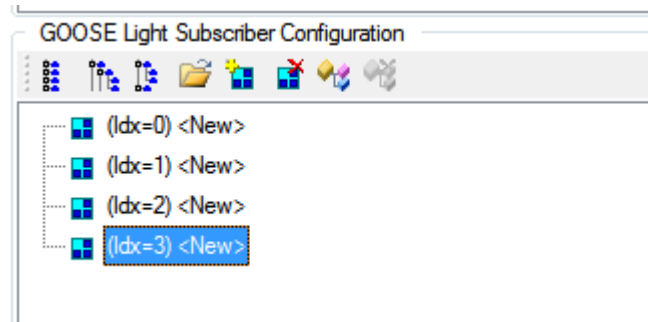
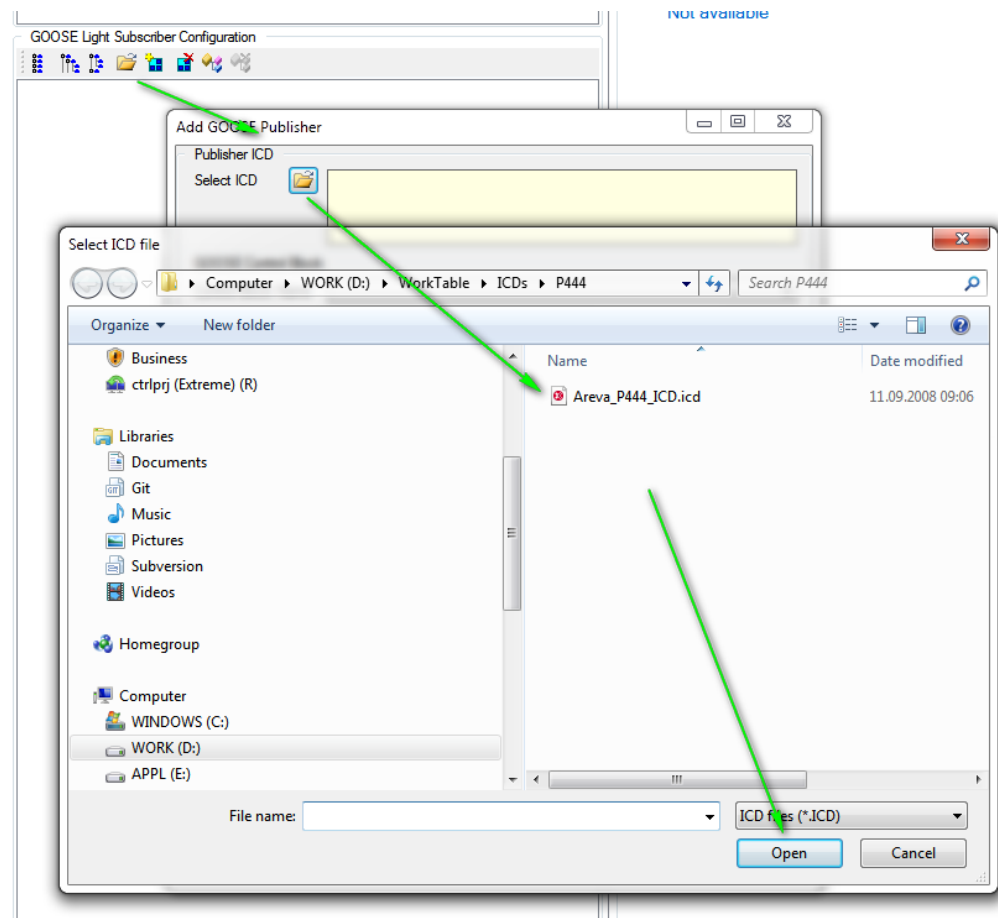



Figure 150: GOOSE *light* Subscribers pane

SCL\_Config is able to create Publisher from ICD file, as shown below.



Add GOOSE Publisher

Publisher ICD  
Select ICD  D:\Work\Table\ICDs\P444\Areva\_P444\_ICD.icd

GOOSE Control Block  
Control Block Name   
DataSet Name  LDevice Instance

Data Set

To Add	Order	LN Class	LN Inst	DO Name	DA Name
<input type="checkbox"/>	1	GGIO	2	Ind1	stVal
<input type="checkbox"/>	2	GGIO	2	Ind1	q
<input checked="" type="checkbox"/>	3	GGIO	2	Ind2	stVal
<input checked="" type="checkbox"/>	4	GGIO	2	Ind2	q
<input checked="" type="checkbox"/>	5	GGIO	2	Ind3	stVal
<input checked="" type="checkbox"/>	6	GGIO	2	Ind3	q
<input checked="" type="checkbox"/>	7	GGIO	2	Ind4	stVal
<input checked="" type="checkbox"/>	8	GGIO	2	Ind4	q
<input type="checkbox"/>	9	GGIO	2	Ind5	stVal
<input type="checkbox"/>	10	GGIO	2	Ind5	q
<input type="checkbox"/>	11	GGIO	2	Ind6	stVal
<input type="checkbox"/>	12	GGIO	2	Ind6	q
<input type="checkbox"/>	13	GGIO	2	Ind7	stVal
<input type="checkbox"/>	14	GGIO	2	Ind7	q
<input type="checkbox"/>	15	GGIO	2	Ind8	stVal
<input type="checkbox"/>	16	GGIO	2	Ind8	q
<input type="checkbox"/>	17	GGIO	2	Ind9	stVal

Ok Cancel

Configuration ICD file GOOSE Light Log

GOOSE Control Blocks

GoCb\_RegATCC

GOOSE Light Subscriber Configuration

(Idx=0) gcbST

- (Num=3) GGIO.2.Ind2.stVal
- (Num=4) GGIO.2.Ind2.q
- (Num=5) GGIO.2.Ind3.stVal
- (Num=6) GGIO.2.Ind3.q
- (Num=7) GGIO.2.Ind4.stVal
- (Num=8) GGIO.2.Ind4.q

Object Editors General settings for GOOSE

GOOSE-light External Publisher Configuration

Settings

Subscriber activate ☒

REG-PE(D) Subscriber Index [0..15]

MAC-Address

GOOSE ID

Control Block Name

DataSet Name

Application ID [dec/hex]  0x  H

Failure Handling

Failure service interval [ms]

After first GOOSE message ☐ 1) Objects will be initialized

☒ 2) Objects will be initialized;  
2) Their commands will be executed

Failure detection commands

At publisher timeout detection this command will be sent

B31=1

If publisher is received successfully again, this command will be sent

B30=1

These Commands will be sent to Logical Device

Station LDevice=A

Comment ...

Figure 151: Add Subscriber from other ICD file

The detailed settings of one subscriber described below.

Table 88: GOOSE subscribed stream settings

Name	Unit	Range	Standard value	Description
Order No. (input number to select):	dec	From 1 up to 16	-	It defines selected number and used to quick select a subscriber.
Description				
REG-PE(D) Subscriber Index [0..15]:	dec	From 0 up to 15	0	Defines the unique index which operates as a primary key for the extern bonded objects. Read only parameter.
Subscriber activate:	checkbox	On/Off	off	It activates subscriber.
GOOSE MAC Address:	hex	6 octet	IEC61850-8	The parameter defines the multicast data link address of the IEC GOOSE Input telegrams.
GOOSE ID:	string	up to 64 symbols	Test_GoID_A	The parameter defines the GOOSE lightidentifier string of GOOSE input telegram. It shall be set identical to a unique identifier publisher.
GOOSE Control Block:	string	up to 64 symbols	Test_GoRef_A	The parameter defines the full name of the Goose control block for IEC GOOSE Publishing without MMS-Control Blocks. It shall have a unique name in one GOOSE.
GOOSE Data Set:	string	up to 64 symbols	Test_GoDs_A	The parameter defines the name of the dataset being sent in IEC GOOSE.
Application ID [dec/hex]:	Hex/dec	From 0 up 16383 (3FFF)	0x3ED or 1001 in decimal notation	The parameter defines the VLAN Appld, which identifies the application using the VLAN (802.1q)
Failure service interval [ms]	ms	0...99999	4000	The parameter defines maximal timeout (ms) for the first message. It is used to set a maximum time to wait for the first message in a subscribed GOOSE <i>lightstream</i> . If an input GOOSE message is not received before the timer expires, the subscriber's alarm status value will be set.
After first GOOSE message:	list	list	executed	<div> 1) Objects will be initialized; 2) Their commands will be executed  1) Objects will be initialized  1) Objects will be initialized; 2) Their commands will be executed  530=1 </div> <p>The parameter defines the handling of first GOOSE telegram.</p> <p>1)After start-up of REG-PEX the process image will be filled with topical value. Only if the value changes it will be sent to eberle device. This makes sense e.g. at auto/man command.</p>



Name	Unit	Range	Standard value	Description
				2)After start-up of REG-PEX the first reception of a GOOSE message will lead to an immediate command to eberle device. This makes sense e.g. at trip/close information of relays for paragramer use, since the eberle device needs an up-to-date-information right from the beginning.
Failure de- tection commands:				Defines behavior and commands in case: At publisher timeout detection If publisher is received successfully again
<div><div>Failure detection commands</div><div>At publisher timeout detection this command will be sent</div><div>B31=1</div><div>If publisher is received successfully again, this command will be sent</div><div>B30=1</div><div>These Commands will be sent to Logical Device</div><div>Station LDevice=A</div></div>				
Comment	string	up to 64 sym- bols	Not de- fault	User commentary for subscriber stream

20.7.5.2 Binding to External Inputs

- List of GOOSE light External Input Objects

The application allows flexible to set properties of external Input Objects (partial data objects from a published GOOSE).

The GOOSE *light*External Input Objects pane contains the information about the subscribed objects and commands, which will be executed after any changing of object's value.

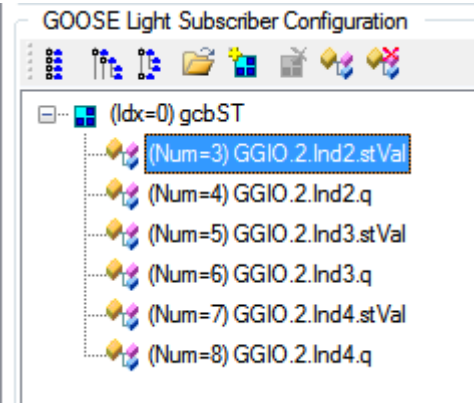


Figure 152: List of GOOSE lightexternal Input Objects

● Input Object Configuration

Double click on an item “Object Configuration” in the left-hand menu.

The GOOSE *light*Input Object Configuration pane contains settings of one object and allows to adjust it’s for a particular structure of GOOSE telegrams.

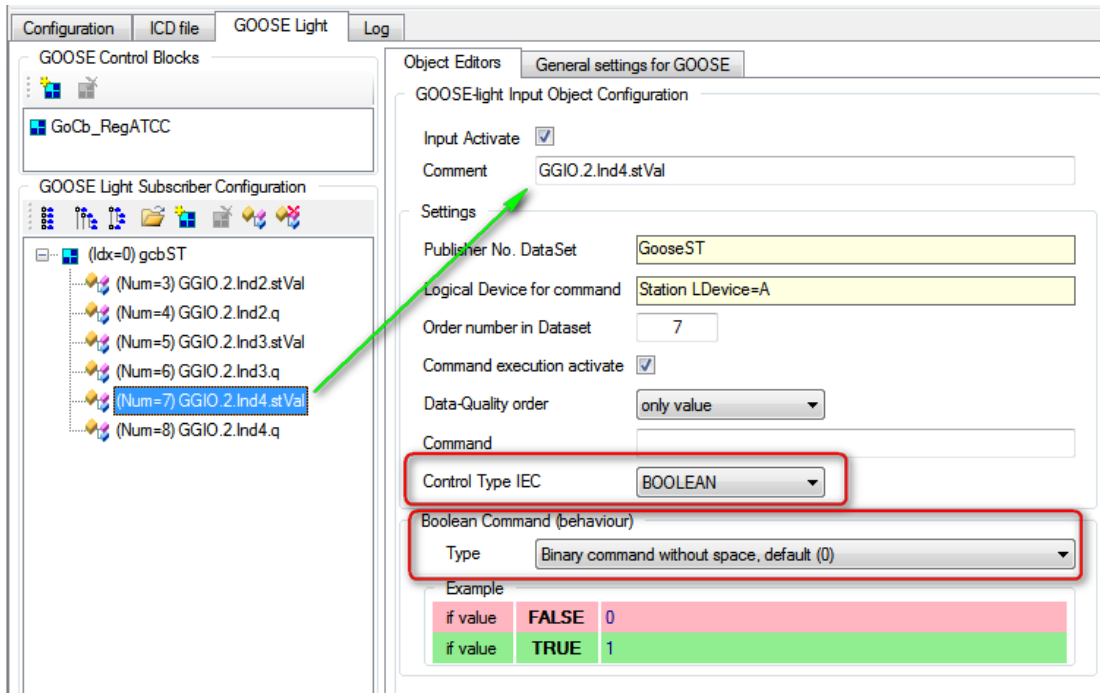


Figure 153: External GOOSE *light*object configuration.

Table 89: External GOOSE *light*object settings

Name	Unit	Range	Standard value	Description
Order No. (input number to select):	dec	Up to 300	1	It defines selected number and used to quick select a data object.
Description				
GOOSE ID and DataSet:	text	Drop down list with 16 subscribers	0	The parameter defines a subscriber which contains this data object.



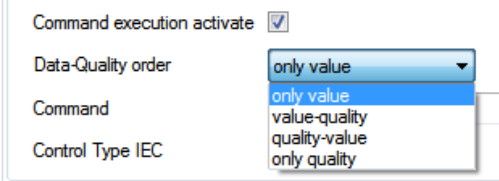
Name	Unit	Range	Standard value	Description
Command	string	REG-L command	B20=	Command string according to RGL-settings of REG-D™
Data-Quality order:	list	Values are listed in the pull-down list.	Value-quality	<p>The parameter defines a kind of quality rating of object in data set. Possible choices are listed in the pull-down list.</p>  <p>Executing types with quality enable to handle the object dependent on of their quality. The object with quality should be represented in GOOSE dataset as two-part data attribute with value and its quality (as Bitstring 13 [0000000000000]). The quality can be located instant before or after value data attribute.</p> <p>Only value: Command must be executed after change of object value, regardless of whether quality is invalid or valid.</p> <p>Value-quality (quality is located instant after value) Object will be accepted only, if its quality is valid. Object quality must be instant follow. If quality is valid and value of the object was changed, command will be executed. Otherwise object will be ignored.</p> <p>Quality-value (quality is located instant before value) Object will be accepted only, if its quality is valid. Object quality must be instant before value. If quality is valid and value of the object was changed, command will be executed. Otherwise object will be ignored.</p> <p>Only Quality Special type. It is used for handling of the quality triggering. If quality will change, a corresponded command will be sent to REGSYS.</p> <p>This type is applicable only for data type QUALITY.</p>
Comment	string	Up to 64 symbols	No	Commentary for configuration.

Table 90: Boolean conversion rules for GOOSE command

Control Type IEC BOOLEAN

Boolean Command (behaviour)

Type Binary command without space, default (0)

Example

if value	F	Double command without space, inverted (1 or -4)
if value	-	Double command without space (-1 or 4)
		Double command with space (3)
		Double command with space, inverted (-3)
		Command without value (2)
		Command without value, if got FALSE (20)
		Command without value, if got TRUE (21)

Table 91: Double Point conversion rules for GOOSE command

Command B21=

Control Type IEC DOUBLEPOINT

DoublePoint Command (behaviour)

Type Command with value, default (0)

Example

if value		Double command for bitstring [32 bit] (2)
if value	[01]	Double command for bitstring [32 bit], inverted (-2)
if value	[01]	B21=1
if value	[10]	B21=2

Scale	Conversion and commands those will be sent									
0 (default)	<div>DoublePoint Command (behaviour)</div> <div>Type <div>Command with value, default (0)</div></div> <div>Example</div> <table><tr><td>if value</td><td>[00]</td><td>B21=0</td></tr><tr><td>if value</td><td>[01]</td><td>B21=1</td></tr><tr><td>if value</td><td>[10]</td><td>B21=2</td></tr></table>	if value	[00]	B21=0	if value	[01]	B21=1	if value	[10]	B21=2
if value	[00]	B21=0								
if value	[01]	B21=1								
if value	[10]	B21=2								
1	<div>DoublePoint Command (behaviour)</div> <div>Type <div>Double command (1)</div></div> <div>Example</div> <table><tr><td>if value</td><td>[00]</td><td></td></tr><tr><td>if value</td><td>[01]</td><td>B21=1</td></tr><tr><td>if value</td><td>[10]</td><td>B21=2</td></tr></table>	if value	[00]		if value	[01]	B21=1	if value	[10]	B21=2
if value	[00]									
if value	[01]	B21=1								
if value	[10]	B21=2								

Scale	Conversion and commands those will be sent									
-1	<div><div>DoublePoint Command (behaviour)</div><div>Type<div>Double command, inverted (-1)</div></div><div><div>Example</div><table><tr><td>if value</td><td>[00]</td><td></td></tr><tr><td>if value</td><td>[01]</td><td>B21=2</td></tr><tr><td>if value</td><td>[10]</td><td>B21=1</td></tr></table></div></div>	if value	[00]		if value	[01]	B21=2	if value	[10]	B21=1
if value	[00]									
if value	[01]	B21=2								
if value	[10]	B21=1								
2...31	<p>Direct Command Rule:</p> <p>First, CMD will be calculated conform with:</p> $CMD = (Bitstring \& 0xC0000000) \gg (scale-2)$ <p>Then, if CMD is 1, command looks same [command][0]. If CMD is 2, command looks same [command][1]</p> <p>For example:</p> <p>1) GOOSE input is [01000000000000].</p> <p>Scale is 13.</p> <p>Command will be completed as [command]0</p> <p>2) GOOSE input is [1000001110000000].</p> <p>Scale is 16.</p> <p>Command will be completed as [command]1</p>									
-31...-2	<div><div>Command<div>B21=</div></div><div>Control Type IEC<div>DOUBLEPOINT</div></div><div><div>DoublePoint Command (behaviour)</div><div>Type<div>Double command for bitstring [32 bit], inverted (-2)</div></div><div>Scale value<div>-2</div></div><div><div>Example</div><table><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td>Shift=</td><td>-2</td><td>B21=[(bitstring&gt;&gt;(-0))]</td></tr></table></div></div></div> <p>Inverse Command Rule:</p> <p>First CMD will be calculated conform with:</p> $CMD = (Bitstring \& 0xC0000000) \gg (2-scale)$ <p>Then, if CMD is 1, command looks same [command][1]. If CMD is 2, command looks same [command][0]</p> <p>For example:</p> <p>1) GOOSE input is [0100000000101].</p> <p>Scale is -13.</p> <p>Command will be completed as [command]1</p> <p>2) GOOSE input is [1000000111110000].</p> <p>Scale is -16.</p> <p>Command will be completed as [command]0</p>							Shift=	-2	B21=[(bitstring>>(-0))]
Shift=	-2	B21=[(bitstring>>(-0))]								

## 20.8 WinConfig Settings

IEC61850 settings are available for TK860 and TK885D telecontrol boards.

Settings for IEC61850 protocol consists of XML template and corresponding ICD file. Both files are contained in WinConfig and corresponding ICD file is automatically selected together with IEC61850 template. Data points and commands are defined in ICD file.

ICD file editor SCL\_Config is also part of WC. SCL-Config and WinConfig share the *IED name* parameter (Intelligent Electronic Device). SCL-Config can be run from the *Settings – SCADA* tree branch using the *Edit ICD file* button. IED name is automatically transferred back to WinConfig when edit in SCL-Config is finished.

## 20.9 Basic

The *Basic* tree branch contains basic settings for IEC61850.

**Basic**

Identification string:

REG-Dx1x61850/G0000SE/CS@REG-PE

IED name:

REGS

Description:

REG-D

Export ICD file

Device	Identifier of device
1	AA:

NTP specific

NTP primary server IP address:

192.168.1.140

NTP secondary server IP address:

192.168.1.5

Confirm

Reset

Figure 154: IEC61850 Basic Settings

IEC61850

Page 231

Table 92: IEC61850 Basic Settings

Setting	Format	Range	Default	Description
Identification string	Text	64 characters	Identification string of open settings	Identification string of open settings
IED name	Text	10 characters	IED name defined in settings	IED (Intelligent Electronic Device) name defined in settings, capital letters only
Description	Text	64 characters	User description defined in settings	User description
Identifier of device	-	3 characters	defaults defined in the Devices tree branch	Identifier of device as appears in the device communication
NTP primary server IP address	-	4x 0 to 255	0.0.0.0	NTP primary server IP address
NTP secondary server IP address	-	4x 0 to 255	0.0.0.0	NTP secondary server IP address



## 20.10 Advanced

### 20.10.1 Serial ports assignment

The Serial ports assignment tree branch is tool for management of telecontrol board serial ports. The serial ports available in telecontrol board are well-arranged in table together with the information about their usage in protocols and COM-Server channels. The page contains also internal checks to avoid conflicts in usage of COM ports. At the same time, the table also allows to switch ON/OFF individual protocols or COM-Server channels.

Serial Ports Settings

Confirm

Reset

Enabled	Usage	Port	TCP port
<input checked="" type="checkbox"/>	Telecontrol protocol serial port	COM2	
<input type="checkbox"/>	CSE serial port	COM4	
<input type="checkbox"/>	DCF serial port	COM1	
<input type="checkbox"/>	Intertrigger serial port	COM3	
<input checked="" type="checkbox"/>	COM-Server serial port	COM2	5001
<input checked="" type="checkbox"/>	COM-Server serial port	COM1	5002
<input checked="" type="checkbox"/>	COM-Server serial port	COM3	5003
<input checked="" type="checkbox"/>	COM-Server serial port	COM3	5013
<input checked="" type="checkbox"/>	COM-Server serial port	COM3	5023
<input checked="" type="checkbox"/>	COM-Server serial port	COM4	5004
<input checked="" type="checkbox"/>	COM-Server serial port	COM2	7001
<input checked="" type="checkbox"/>	COM-Server serial port	COM1	7002
<input checked="" type="checkbox"/>	COM-Server serial port	COM3	7003
<input checked="" type="checkbox"/>	COM-Server serial port	COM4	7004

Figure 155: IEC61850 Serial Ports Settings

Table 93: IEC61850 Serial Ports Settings

Setting	Format	Range	Default	Description
Enabled	checkbox	ON/OFF		Checkbox enables/disables corresponding protocol (COM-Server channel)
Usage	text	-		Definition of corresponding protocol /COM-Server channel (read only)
Port	-	Selection of values in combo box		Selection of corresponding COM port
TCP port	-	-		TCP port used by CS channels (read only)

### 20.10.2 Settings - SCADA

Under this Item you can Export ICD-file. Default values should only be changed if you received an explicit instruction. During the System engineering phase some settings regarding the SCL ICD file might have to be adjusted (like the IED Server name for example.). This setting can be done offline with WinConfig.

The naming of the ICD-file is flexible. The import ICD-file with name xxx.icd changes SCL name in parameter from current name to xxx.icd.

Settings – SCADA tree branch shows information concerning IEC61850 protocol and allows TCP configuration. The button Export ICD file can be used for corresponding export and the button Edit ICD file runs the SCL-Config for ICD file edit.

IEC61850

Version of settings: REG-Dx1x61850/GOOSE/CS@REG-PE(D)

Control version number: 6300

Mode of watchdog LED: blinking

Firmware version: REGSYSxIEC61850/GOOSE/COMServer@REG-PE(D)

Firmware build: V8.3.5

ICD file name: eberle43\_REG-Dx1\_120914\_Std.icd

Export ICD file

Edit ICD file

Import ICD file

Browse...Import

Ethernet interfaces

IEC: eth0

GOOSE: eth0

TCP configuration

Configure TCP

Keep alive interval: 3

Keep alive probes: 4

Keep alive time: 15

Common behavior

Enter Password to unlock:

Unlock

Activate origin of Commands: false

File transfer

Activate:

Confirm

Reset

Figure 156: IEC61850 Settings - SCADA

Table 94: IEC61850 Settings - SCADA

Setting	Format	Range	Default	Description
Version of settings	-	-		Version of settings (read only)
Control version number	-	-		Control version number (read only)
Mode of watchdog LED	-	Selection of values in		Mode of watchdog LED, blinking or switch off

IEC61850

Page 235

Setting	Format	Range	Default	Description
		combo box		
Firmware version	-	-		Firmware version (read only)
Firmware build	-	-		Firmware build (read only)
ICD file name	-	-		ICD file name (read only)
IEC		Selection of values in combo box	Eth0	Selection of Ethernet interface for IEC protocol
GOOSE		Selection of values in combo box	Eth0	Selection of Ethernet interface for GOOSE
Configure TCP		checkbox	unchecked	Configure TCP
Keep alive interval		Selection of values in combo box	3	Keep alive interval
Keep alive probes		Selection of values in combo box	4	Keep alive probes
Keep alive time		0 to 20	15	Keep alive time
Common behaviour: Password	textbox			Password to unblock the following option
Common behaviour: activate origin of commands		Selection of values in combo box	false	activate origin of commands
File transfer: Activate		checkbox	unchecked	Activation of file transfer

### 20.10.3 ELAN extension (CSE)

The *ELAN extension (CSE)* tree branch can be used for activation and configuration of CSE.

## ELAN extension over Eth. (CSE)

Version1.07.00 build 2012-08-27

Activate CSE☐

Interface settings

Serial port:

COM4

Baud rate of serial port [Bd]:

115200

Parity:

None

RTS/CTS:

off

XON/XOFF:

off

Listen port

Port:

13030

Interface:

Send ports

Activate	IP address	Port
No	192.168.55.30	13030
Yes	192.168.55.31	13031
Yes	192.168.55.32	13032
Yes	192.168.55.33	13033
Yes	192.168.55.34	13034
Yes	192.168.55.35	13035
Yes	192.168.55.36	13036
Yes	192.168.55.37	13037

Confirm

Reset

Figure 157: ELAN extension over Ethernet (CSE)

Table 95: ELAN extension over Ethernet (CSE)

Setting	Format	Range	Default	Description
Version	-	-		CSE version (read only)
Activate CSE	checkbox	ON/OFF		CSE switch ON/OFF
Serial port	-	-	COM4	Selection of CSE serial port (Read only). To change CSE serial port go to Serial ports assignment tree branch
Baud rate of serial port	Bd	-	115200	Baud rate of serial port (read only)
Parity	-	-	none	Parity (read only)
RTS/CTS	-	ON/OFF	off	RTS/CTS (read only)
XON/XOFF	-	ON/OFF	off	XON/XOFF(read only)
Port	-	1 to 65535		TCP listen port
Interface	-	Selection of values in combo box		Selection of Ethernet interface
Activate	-	Selection of values in combo box		Activation of TCP send port (Yes/No)
IP address		4x 0 to 255		IP address
Port		0 to 65535		TCP port

**20.10.3.1 Use case: Setting for two REG-PE(X) connected via CSE**

In the following example, two REG-PEDs were used, where the first REG-PED had the IP 193.162.58.1 and the second 193.168.58.3. The channel of the device has to be set to non-activated. In the following use case port addresses 130030 till 130037 were predefined and the first two used.

**Configuration of the first REG-PED**

**ELAN extension over Eth. (CSE)**

Version 1.06.00 build 10

Activate CSE ☒

Interface settings

Serial port: COM1

Baud rate of serial port [Bd]: 115200

Parity: None

Listen port

Port: 13030

Send ports

Activate:	IP address	Port
No	193.168.58.1	13030
Yes	193.168.58.3	13031
Yes	192.168.55.32	13032
Yes	192.168.55.33	13033
Yes	192.168.55.34	13034
Yes	192.168.55.35	13035
Yes	192.168.55.36	13036
Yes	192.168.55.37	13037

Confirm

Reset

**Configuration of the second REG-PED**

**ELAN extension over Eth. (CSE)**

Version 1.06.00 build 10

Activate CSE ☒

Interface settings

Serial port: COM2

Baud rate of serial port [Bd]: 115200

Parity: None

Listen port

Port: 13031

Send ports

Activate:	IP address	Port
Yes	193.168.58.1	13030
No	193.168.58.3	13031
Yes	192.168.55.32	13032
Yes	192.168.55.33	13033
Yes	192.168.55.34	13034
Yes	192.168.55.35	13035
Yes	192.168.55.36	13036
Yes	192.168.55.37	13037

Confirm

Reset



20.10.4 COM-Server

The *COM-Server* tree branch can be used for activation and configuration of COM-Server channels.

The table of COM-Server channels shows basic parameters. To show all channel parameters press the *Extend* button. For changing the serial port number go to *Serial ports assignment* tree branch.

COM-Server

Confirm

Reset

Add

Insert

Delete

Extend

Rows count: 10

Enter Password to Extend:

<input type="checkbox"/>	Activate:	Connection type	IP address	TCP port	Inactivity timeout [s]	Serial port	Baud rate	Parity	XON/XOFF	RTS/CTS
<input type="checkbox"/>	Yes	Socket	0.0.0.0	5001	180	COM2	115200	None	Yes	No
<input type="checkbox"/>	Yes	Socket	0.0.0.0	5002	180	COM1	115200	None	Yes	No
<input type="checkbox"/>	Yes	Socket	0.0.0.0	5003	180	COM3	115200	None	Yes	No
<input type="checkbox"/>	Yes	Socket	0.0.0.0	5013	180	COM3	115200	None	No	Yes
<input type="checkbox"/>	Yes	Socket	0.0.0.0	5023	180	COM3	115200	None	Yes	Yes
<input type="checkbox"/>	Yes	Socket	0.0.0.0	5004	180	COM4	115200	None	Yes	No
<input type="checkbox"/>	Yes	Telnet	0.0.0.0	7001	180	COM2	115200	None	Yes	No
<input type="checkbox"/>	Yes	Telnet	0.0.0.0	7002	180	COM1	115200	None	Yes	No
<input type="checkbox"/>	Yes	Telnet	0.0.0.0	7003	180	COM3	115200	None	Yes	No
<input type="checkbox"/>	Yes	Telnet	0.0.0.0	7004	180	COM4	115200	None	Yes	No

Figure 158: IEC61850 - COM-Server

COM-Server

Confirm

Reset

Add

Insert

Delete

Extend

Rows count: 10

Enter Password to Extend: .....

ddress	TCP port	Inactivity timeout [s]	Serial port	Baud rate	Parity	Stop bits	Data bits	XON/XOFF	RTS/CTS	RTS/CTS inverted	RxD/TxD inverted	Interface type	Max. message length	Tx blocking time [ms]
	5001	180	COM2	115200	None	1	8	Yes	No	No	No	RS232	0	0
	5002	180	COM1	115200	None	1	8	Yes	No	No	No	RS232	0	0
	5003	180	COM3	115200	None	1	8	Yes	No	No	No	RS232	0	0
	5013	180	COM3	115200	None	1	8	No	Yes	No	No	RS232	16	10

Figure 159: IEC61850 - COM-Server Extended



Table 96: IEC61850 - COM-Server

Setting	Format	Range	Default	Description
Activate	-	Selection of values in combo box		Option to activate the CS channel (Yes/No)
Connection type	-	Selection of values in combo box		Type of connection. <i>OFF</i> disables the port from accepting connections. It can be turned on later. <i>Socket</i> enables the port and transfers all data as-is between the port and the device. <i>Serial direct</i> enables the port and transfers all input data to device, device is open without any POSIX setting or directly. <i>Telnet</i> enables the port and runs the telnet protocol on the port to set up telnet settings. This is most useful for using telnet.
IP address	-	4x 0 to 255		IP address
TCP port	-	0 to 65535	3003	TCP port
Inactivity timeout	S		180	Inactivity timeout
Serial port	-	Selection of values in combo box		Serial port (read only). To change serial port go to <i>Serial ports assignment</i> tree branch
Baud rate	Bd	Selection of values in combo box	115200	Baud rate
Parity	-	Selection of values in combo box	None	Parity (read only)
Stop bits	-	Selection of values in combo box	1	Stop bits
XON/XOFF	-	Selection of values in combo box	No	XON/XOFF handshaking
RTS/CTS	-	Selection of values in combo box	No	RTS/CTS handshaking
RTS/CTS inverted	-	Selection of values in combo box	No	RTS/CTS inverted
Interface type	-	Selection of values in combo box	RS232	Interface type (RS232, RS485)
Max. message length	-	0 to 65535	0	Max. message length
Tx blocking time	ms		0	Tx blocking time

### 20.10.5 Supervisory settings

The *Supervisory settings* tree branch can be used for activation and configuration of debug logs.

Supervisory

Level: User

Trace-options

Activate trace

Trace Output

Trace via PARAM-connector (limited capacity due to RS232-bottleneck):

Trace via TCP-Port (recommended):

TCP, File

TCP-Port:

Log to File (Attention! Available memory on board very limited!)

Logging with Timestamp (Attention! Causes performance reduction!):

CSE Trace

Activate:

TCP-Port:

DCF77 Trace

Activate:

TCP-Port:

COM-Server Trace

Activate Trace:

Trace Output:

Trace via PARAM-Connector (limited capacity due to RS232-bottleneck):

Trace via TCP-Port (recommended):

TCP-Port:

Logging with Timestamp (Performance reduction!):

COM-Server Tx-Rx Mirroring

Activate

TCP-port:

Confirm

Reset

*Figure 160: IEC61850 Supervisory settings*

Table 97: IEC61850 Supervisory settings

[illegible]

Setting	Format	Range	Default	Description
CSE trace: Activate	-	checkbox	unchecked	CSE trace activation
CSE trace: TCP port	-	1 to 65535	10888	TCP port
DCF77 trace: Activate	-	checkbox	unchecked	DCF77 trace activation
DCF77 trace: TCP port	-	1 to 65535	10777	TCP port
COM-Server Trace: Activate Trace	-	checkbox	unchecked	COM-Server Trace activation
COM-Server Trace: Trace Output	-	checkbox	unchecked	COM-Server Trace: Verbose Output
COM-Server Trace: Trace via PARAM-Connector	-	radio button	checked	Radio button to select PARAM-Connector or TCP port as output interface for COM-Server debug messages
COM-Server Trace: Trace via TCP Port:	-	radio button	unchecked	
COM-Server Trace: TCP port	-	1 to 65535	10897	COM-Server Trace: TCP port
COM-Server Trace: Logging with Timestamp	-	checkbox	checked	COM-Server Trace: Logging with Timestamp
Mirroring: Activate	-	checkbox	unchecked	Mirror port debug option activation
Mirroring: TCP port	-	1 to 65535	55777	Mirror port: TCP port

### 20.10.6 Time synchronization

The NTP (Network Time Protocol) Configuration is used for time synchronization.

The SNTP client is implemented as a single thread which periodically requests NTP servers or listens for NTP broadcasts and Ipv4 multicasts, and optionally sends SNTP unicast requests to defined NTP servers. The SNTP-client will be automatically started by the start of the application, if it receives a list of NTP servers (main and secondary) from the sntp.param file. Otherwise time is not synchronized by the user with NTP- server.

REG-PE / REG-PED use these servers for installation of system time at real time.

The current SNTP settings provide one or two IP addresses of the NTP servers available for time synchronization. One server acts as primary server and the other as a backup server. The NTP servers must be listed in the order of preference. You can choose your preferred NTP servers (on default – *Main NTP server*). REG-PE / REG-PED analyses the availability of servers, their priority, and also their switching.

If the main NTP-Server does not work or is not defined, time is set by the secondary NTP-Server.

NTP-Servers provide first time synchronization at the start of the application. If your NTP-Servers support broadcast request-responses, a first time synchronization can proceed up to 10 seconds before.

Time synchronization

NTP specific

NTP primary server IP address:

192.168.1.140

NTP secondary server IP address:

192.168.1.5

Period between the attempts to set the clock:

16 sec

Max. timeout for the server response:

1 sec

Number of time samples in each clock cycle:

3 samples

Minimal time offset of clock relative to server:

0.000001

Scale for estimation of the NTP-offset worth:

1

DCF77 synchronization specific

Version

1.04.00 build 10

DCF77 clock activate:

Yes

No

Device synchronization specific

Strategy of the device time synchronization:

all

only attached device

only the following list

List of synchronized devices:

Sync. period of connected devices [min]:

5

Confirm

Reset

Figure 161: IEC61850 Time synchronization

Table 98: IEC61850 Time synchronization

Setting	Format	Range	Default	Description
NTP primary server IP address	-	4x 0 to 255	192.168.1.140	NTP primary server IP address
NTP secondary server IP address	-	4x 0 to 255	192.168.1.5	NTP secondary server IP address
Period between the attempts to set the clock	sec	Selection of values in combo box	16 sec	Period between the attempts to set the clock
Max. timeout for the server response	sec	Selection of values in combo box	1 sec	Max. timeout for the server response
Number of time samples in each clock cycle	-	Selection of values in combo box	3 samples	Number of time samples in each clock cycle
Minimal time offset of clock relative to server	sec	float	0.000001	Minimal time offset of clock relative to server
Scale for estimation of the NTP-offset worth	-		1	Scale for estimation of the NTP-offset worth
DCF77: Version	-	-		DCF77: Version (Read only)
DCF77 clock activate	-	Radio button	No	DCF77 clock activate
Strategy of device time synchronization	-	Selection of check-boxes	Only attached device	<p>The Firmware includes a very flexible yet simple mechanism for time synchronization schemes for attached devices. There are three strategy types: all devices, only device, device-list and DCF77. The all devices scheme allows for a synchronizing of the all devices in E-LAN or per Time-Bus.</p> <p>The only device scheme allows for a time synchronization of the only first device. In standard settings a first device is master in E-LAN.</p> <p>The device-list scheme allows for a specific time synchronization of the devices specified in the "List of the synchronized devices" fields. Each field specifies the a-Eberle ID-device.</p> <p>The DCF77 scheme: the firmware sends DCF77 time to device, which can be set in 3 modes. The REG-L time synchronization command via COM2 is not used here.</p> <p>DCF77 device modes:</p>

Setting	Format	Range	Default	Description
				<p>SINGLE: via COM1/2 can be synchronized the system time in the DCF mode. The time synchronization bus is not supported.</p> <p>SLAVE: the time synchronization bus synchronizes the device system time.</p> <p>MASTER: device receives the time via COM1 in the DCF mode, the DCF signal is switched directly to the synchronization bus. Otherwise the device sends his system time as DCF telegram via the synchronization bus.</p>
Sync. period of connected devices	min	1 to 65535	5	The parameter determines an interval time between the sequential time synchronizations by NTP servers. It is applied for the all attached devices according to the selected "Strategy of the device time synchronization ". Value is configurable in the range 0...255. The default value is 5.

20.10.6.1 UTC-Settings by REG-Sys equipment

Connect the REG-Sys (REG-D, REG-DP, PQI-D and EOR-D) IED COM1 by using the delivered RS-232 Null Modem Cable with your PC. Use a terminal-program, e.g. WinReg, for the UTC-settings.

If the regulator has the station-ID A: you will see after pressing the ↵ button:

<A>

Afterwards you can take following time zone settings:

utcTZ [= <time zone>]                      Time Zone:                      -12..0..+12 hours (part of an hour (e.g. 9.75)  
utcDST [= <use dst>]                      Daylight Saving Time: 0=not used, 1=used  
utcSH [= <south hemisphere>] Hemisphere:                      0:north, 1:south

The system is now adjusted for correct time synchronization.

Example settings for Germany, time zone 1, daylight saving time and north hemisphere:

utcTZ = 1                      TimeZone = 1  
utcDST = 1                      Daylight Saving Time = Yes  
utcSH = 0                      South Hemisphere = No



### 20.10.7 Internal communication

This tree branch contains settings concerning the internal communication between telecontrol board and the device.

**Internal communication**

Serial communication

Serial port:

COM2

Baud rate of device serial port [Bd]:

115200

Parity:

EVEN

ON time of serial LEDs [ms]:

10

Cycle time of poll [ms]:

300

Maximum timeout between sequenced ASCII-Data [ms]:

800

Cycle time of device status check [ms]:

2000

Number of repeats for SYNC cycle:

2

Number of poll repeats:

1

Round time down:

☐

Device IP address request repetition:

120

Double point events

Insensitive interval [ms]:

1000

Command behaviour

Wait for change timeout [ms]:

8000

SBO deselection timeout [ms]:

10000

Command executed on startup:

Confirm

Reset

Figure 162: IEC61850 Internal communication

Table 99: IEC61850 Internal communication

Setting	Format	Range	Default	Description
Serial port	-	-	COM2	Serial port for internal communication with device (read only). To change serial port go to Serial ports assignment tree branch
Baud rate of device serial port	Bd	Selection of values in combo box	115200	Baud rate of device serial port
Parity	-	Selection of values in combo box	EVEN	Serial port parity
ON time of serial LEDs	ms	1 to 65535	10	ON time of serial LEDs
Cycle time of poll	ms	0 to 65535	300	The parameter determines the cycle time of the substation call. If you set the parameter to zero, the call is executed as soon as possible. Value is configurable in the range 0...65535. The default value is 150.
Maximum timeout between sequenced ASCII-Data	ms	0 to 65535	800	This parameter specifies how long the program waits for sequenced next frame (data > 2000 Bytes) or the acknowledgement for command. The wait time is dependent on the baud rate and the maximum message length. Value is configurable in the range 0...65535. The default value is 800.
Cycle time of device status check	ms	0 to 65535	2000	This parameter specifies the cycle time with which the program checks the link status of the device is polling in the case of error in serial or frame. Value is configurable in the range 0...65535. The default value is 1500...
Number of repeats for SYNC cycle	-	1 to 255	2	Defines a maximal count of synchronization requests, if serial communication with XXXSys™-Device fails. The parameter can be adjusted from 0...255. By default it is 2.
Number of poll repeats	-	0 to 255	1	Defines a maximal number of repetitions of one command. Default value is 2.
Round time down		checkbox	unchecked	If value equals "No", time stamps are rounded up in scale of one second to prevent time inconsistencies with substation. If value equals "Yes", time stamps are rounded down in scale of one second. Default value is "Yes".
Device IP address request repetition		0 to 65535	120	Defines number of polls after which IP-address, netmask and gateway are requested from a-Eberle device. They will be set then in the loader environment. The feature is supported only for REGSys devices. Value is configurable in the range 0...255. The default value is 0.

Setting	Format	Range	Default	Description
Wait for change timeout	ms	100 to 65535	8000	Maximal waiting time of the changes caused by the command. Value is configurable in the range 0...65535. The default value is 8000.
SBO unselecting timeout	ms	100 to 65535	10000	Maximal waiting time of the Operate request after receipt of a Select request. Value is configurable in the range 0...65535. The default value is 10000.
Command executed on startup	text	64 characters	empty	Command that will be executed once after startup.

20.10.8 Attached Devices

Special device settings are valid for each individual attached device. The default values must be adjusted to the respective device. A complete data record describes an attached device. Up to eight a-Eberle devices can be attached.

This tree branch contains specific device settings.

Device Request Settings

Identifier of device:

AA:

Poll string:

RPS 4

Size of answer [byte]:

244

Type of seconds field:

INT32U

Offset of seconds field [byte]:

18

Type of msec field:

INT16U

Offset of msec field [byte]:

22

Comment:

REG-D a-Eberle

Confirm

Reset

Figure 163: IEC61850 Device x

Advanced	
LDevice Instance in ICD-file	The parameter defines device identification by its number. It must be the same as the IEC61850 Logical Device (LD) instance number (e.g., logical device name REG2 must have value 2 for "Device relocation").

Table 100: IEC61850 Device x

Setting	Format	Range	Default	Description
LDevice Instance in ICD-file	text	Uppercase up to 10 char	no	The parameter defines device identification by its number. It must be the same as the IEC61850 Logical Device (LD) instance number (e.g., logical device name REG2 must have value 2 for “Device relocation”).
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	The parameter defines an XXXSys™-Device name. The name should consist of 2 or 3 characters. A template of the name is: [A-Z] [empty or 0-9] [:]. (E.g., “F:””A8:””V7”). By default it is “A:” for regulators.
Poll string	text	24 characters	RPS 4	The parameter defines a poll string for a serial request. By default it is “RPS 4” for attached regulators, for other devices it is preconfigured in a different way.
Size of answer	byte	1 to 255	244	The parameter defines a size of answer corresponding to selected poll string
Type of seconds field	-	Selection of values in combo box	Int32U	The parameter defines type of a second’s value in defined poll string. Default value REGSys™ - “INT32”.
Offset of seconds field	byte	0 to 255	18	The parameter defines the byte offset in defined poll string which includes a second’s part of time. Default value is 18.
Type of msec field	-	Selection of values in combo box	Int32U	The parameter defines type of a milliseconds part of time in poll string. Default value for REGSys™ - “INT16”.
Offset of msec fieldbyte	byte	0 to 255	22	The parameter defines the byte offset in defined poll string which includes a milliseconds part of time. Default value is 22.
Comment	text	23 characters		User comment

### 20.10.9 Saving of settings in IEC61850

As the settings for IEC61850 protocol consist of XML template and ICD file, the Save selected settings to file icon offers separately saving of settings and saving of ICD file.

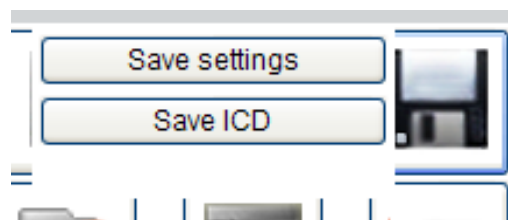


Figure 164: Saving of settings in IEC61850

## 21. WinConfig in Step-by-Step mode

To run WinConfig in *Step-by-Step* mode click the *Step-by-Step* button in the splash screen when WinConfig starts.

WinConfig *Step-by-Step* mode is especially useful case when default configuration settings can be used with minimum modifications and the simplest failsafe way of data transfer. *Step-by-Step* mode enables user to create and use typical configuration of settings without having exact knowledge of SCADA protocol data point settings, protocol standards, firm-ware-specific settings and other complex settings.

User typically selects board type, SCADA and device template and enters a few application-specific settings to create settings and to load the created settings into the board in the corresponding step. *Step-by-Step* mode also gives the possibility to open settings pre-defined in advanced mode (XML file) or settings created in GenReg (INI file).

Quick help is displayed in all steps in the right part of window to explain the corresponding settings and actions.

The *Confirm* button switches to the next step (all entered values remembered).

The *Back* button switches to the previous step (all entered values on the current form will be forgotten).

The *Cancel* button switches to the first step (all previously entered values on the current form/s will be forgotten).

The *Finish* button completes the protocol settings transactions and switches the user to the first step for another round of protocol settings should the user choose to enter another set of settings (only on the last page).

### 21.1 Templates in Step-by-Step mode

*Step-by-Step* mode of WinConfig works with pre-defined templates of settings as described in chapter 8.2.1.1. Thus usage of templates is limited to configurations containing known and already used combination of *board\_type/protocol/SCADA\_template/Devices\_template*. WinConfig will be equipped with other templates in new versions as soon as new templates will be available.

Individual steps are numbered according to the sequence valid for the individual board and protocol.

## 21.2 Step 1 - hardware

User selects pre-defined type of telecontrol board in the first step. Selection is done in the corresponding combo box.

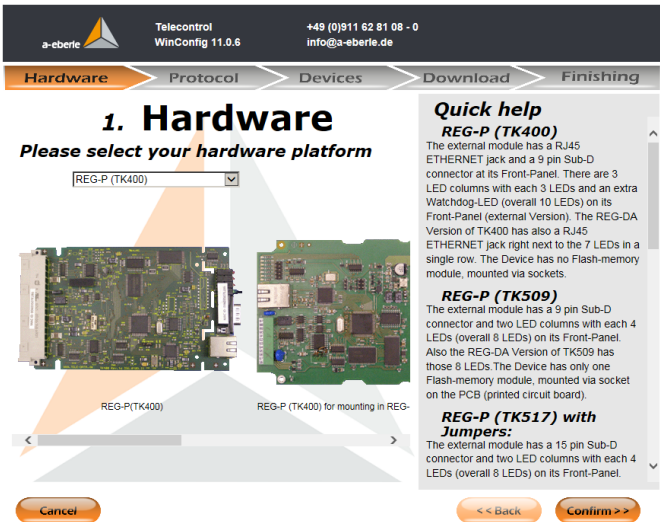


Figure 165: Selection of hardware

## 21.3 Protocol and templates

The selection of protocol is performed in next step. Available options are stated in the following table.

Table 101: Protocols and templates

Board	Protocol	SCADA	Devices	Template availability	Note
TK509, TK517, TK400,	DNP3	Basic	REG-D	Yes	Basic template type of SCADA is defined as typical configuration not related to particular SCADA producer
		Basic	REG-DP	No	
		ABB	REG-D	Yes	
	IEC101	Areva	REG-D	No	
		IDS	REG-D	Yes	
		SAT	REG-D	Yes	
		Siemens	REG-D	No	
		Sprecher	REG-D	No	
		Basic	REG-DP	Yes	
		ABB	REG-DP	No	
		Areva	REG-DP	No	
		IDS	REG-DP	Yes	
		SAT	REG-DP	No	
		Siemens	REG-DP	No	
		Sprecher	REG-DP	No	
	IEC101	Basic	EOR-D	Yes	
		ABB	EOR-D	No	
		Areva	EOR-D	No	
		IDS	EOR-D	No	
		SAT	EOR-D	No	
		Siemens	EOR-D	No	
		Sprecher	EOR-D	No	
		Basic	2x REG-D	Yes	
		ABB	2x REG-D	No	
		Areva	2x REG-D	No	
	IEC101	IDS	2x REG-D	No	
		SAT	2x REG-D	No	
		Siemens	2x REG-D	No	
		Sprecher	2x REG-D	No	
		Basic	3x REG-D	Yes	

Board	Protocol	SCADA	Devices	Template availability	Note
		ABB	3x REG-D	No	
		Areva	3x REG-D	No	
		IDS	3x REG-D	No	
		SAT	3x REG-D	No	
		Siemens	3x REG-D	No	
		Sprecher	3x REG-D	No	
	IEC101	Basic	4x REG-D	Yes	
		ABB	4x REG-D	No	
		Areva	4x REG-D	No	
		IDS	4x REG-D	No	
		SAT	4x REG-D	No	
		Siemens	4x REG-D	No	
		Sprecher	4x REG-D	No	
	IEC101	Basic	2x REG-DP	Yes	
		ABB	2x REG-DP	No	
		Areva	2x REG-DP	No	
		IDS	2x REG-DP	No	
		SAT	2x REG-DP	No	
		Siemens	2x REG-DP	No	
		Sprecher	2x REG-DP	No	
	IEC101	Basic	4x REG-DP	Yes	
		ABB	4x REG-DP	No	
		Areva	4x REG-DP	No	
		IDS	4x REG-DP	No	
		SAT	4x REG-DP	No	
		Siemens	4x REG-DP	No	
		Sprecher	4x REG-DP	No	
	IEC101	Basic	REG-D + REG-DP	Yes	
		ABB	REG-D + REG-DP	No	
		Areva	REG-D + REG-DP	No	
		IDS	REG-D + REG-DP	No	
		SAT	REG-D + REG-DP	No	
		Siemens	REG-D + REG-DP	No	
		Sprecher	REG-D + REG-DP	No	
	IEC101	Basic	2x REG-D + 1x REG-DP	Yes	
		ABB	2x REG-D + 1x REG-DP	No	
		Areva	2x REG-D + 1x REG-DP	No	
		IDS	2x REG-D + 1x	No	



Board	Protocol	SCADA	Devices	Template availability	Note
			REG-DP		
		SAT	2x REG-D + 1x REG-DP	No	
		Siemens	2x REG-D + 1x REG-DP	No	
		Sprecher	2x REG-D + 1x REG-DP	No	
	IEC101	Basic	1x REG-D + 2x REG-DP	No	
		ABB	1x REG-D + 2x REG-DP	No	
		Areva	1x REG-D + 2x REG-DP	No	
		IDS	1x REG-D + 2x REG-DP	No	
		SAT	1x REG-D + 2x REG-DP	No	
		Siemens	1x REG-D + 2x REG-DP	No	
		Sprecher	1x REG-D + 2x REG-DP	No	
	IEC101	Basic	2x REG-D + 2x REG-DP	Yes	
		ABB	2x REG-D + 2x REG-DP	No	
		Areva	2x REG-D + 2x REG-DP	No	
		IDS	2x REG-D + 2x REG-DP	No	
		SAT	2x REG-D + 2x REG-DP	No	
		Siemens	2x REG-D + 2x REG-DP	No	
		Sprecher	2x REG-D + 2x REG-DP	No	
	IEC101	Basic	2x REG-DP + 1x EOR-D	Yes	
		ABB	2x REG-DP + 1x EOR-D	No	
		Areva	2x REG-DP + 1x EOR-D	No	
		IDS	2x REG-DP + 1x EOR-D	No	
		SAT	2x REG-DP + 1x EOR-D	No	

Board	Protocol	SCADA	Devices	Template availability	Note
		Siemens	2x REG-DP + 1x EOR-D	No	
		Sprecher	2x REG-DP + 1x EOR-D	No	
	IEC103	Other	REG-D	Yes	
		ABB	REG-D	Yes	
		Areva	REG-D	Yes	
		DB	REG-D	No	
		IDS	REG-D	No	
		Mauell	REG-D	Yes	
		NRM	REG-D	No	
		SAT	REG-D	Yes	
		Siemens	REG-D	Yes	
		Sprecher	REG-D	Yes	
	IEC103	Basic	REG-DP	Yes	
		ABB	REG-DP	Yes	
		Areva	REG-DP	Yes	
		DB	REG-DP	No	
		IDS	REG-DP	No	
		Mauell	REG-DP	No	
		NRM	REG-DP	No	
		SAT	REG-DP	Yes	
		Siemens	REG-DP	Yes	
		Sprecher	REG-DP	Yes	
	IEC103	Basic	EOR-D	Yes	
		ABB	EOR-D	No	
		Areva	EOR-D	No	
		DB	EOR-D	No	
		IDS	EOR-D	No	
		Mauell	EOR-D	No	
		NRM	EOR-D	No	
		SAT	EOR-D	No	
		Siemens	EOR-D	No	
		Sprecher	EOR-D	No	
	IEC103	Basic	2x EOR-D	No	
		ABB	2x EOR-D	No	
		Areva	2x EOR-D	No	
		DB	2x EOR-D	No	
		IDS	2x EOR-D	No	
		Mauell	2x EOR-D	No	
		NRM	2x EOR-D	No	

Board	Protocol	SCADA	Devices	Template availability	Note
		SAT	2x EOR-D	No	
		Siemens	2x EOR-D	No	
		Sprecher	2x EOR-D	No	
	IEC103	Basic	3x EOR-D	No	
		ABB	3x EOR-D	No	
		Areva	3x EOR-D	No	
		DB	3x EOR-D	No	
		IDS	3x EOR-D	No	
		Mauell	3x EOR-D	No	
		NRM	3x EOR-D	No	
		SAT	3x EOR-D	No	
		Siemens	3x EOR-D	No	
		Sprecher	3x EOR-D	No	
	IEC103	Basic	PQI-D	No	
		ABB	PQI-D	No	
		Areva	PQI-D	No	
		DB	PQI-D	No	
		IDS	PQI-D	No	
		Mauell	PQI-D	No	
		NRM	PQI-D	No	
		SAT	PQI-D	No	
		Siemens	PQI-D	No	
		Sprecher	PQI-D	No	
	CSO	-	-	Yes	No SCADA or device specific data are applicable for CSO protocol. CSO is not available for TK509 and TK517 boards.
TK8xx	DNP3	Basic	REG-D	Yes	
		Basic	REG-DP	Yes	
		Basic	EOR-D	Yes	
		TRANS POWER	REG-D	Yes	
		UNISON	REG-D	Yes	
	IEC101	Basic	REG-D	Yes	
	IEC103	Basic	REG-D	Yes	
		ABB	REG-D	No	
		Areva	REG-D	No	
		DB	REG-D	No	
		IDS	REG-D	No	
		Mauell	REG-D	No	
		NRM	REG-D	No	

Board	Protocol	SCADA	Devices	Template availability	Note
		SAT	REG-D	No	
		Siemens	REG-D	No	
		Sprecher	REG-D	No	
	IEC103	Basic	REG-DP	No	
		ABB	REG-DP	No	
		Areva	REG-DP	No	
		DB	REG-DP	No	
		IDS	REG-DP	No	
		Mauell	REG-DP	No	
		NRM	REG-DP	No	
		SAT	REG-DP	No	
		Siemens	REG-DP	No	
		Sprecher	REG-DP	No	
	IEC103	Basic	EOR-D	No	
		ABB	EOR-D	No	
		Areva	EOR-D	No	
		DB	EOR-D	Yes	
		IDS	EOR-D	No	
		Mauell	EOR-D	No	
		NRM	EOR-D	No	
		SAT	EOR-D	No	
		Siemens	EOR-D	No	
		Sprecher	EOR-D	No	
	IEC103	Basic	2x EOR-D	No	
		ABB	2x EOR-D	No	
		Areva	2x EOR-D	No	
		DB	2x EOR-D	Yes	
		IDS	2x EOR-D	No	
		Mauell	2x EOR-D	No	
		NRM	2x EOR-D	No	
		SAT	2x EOR-D	No	
		Siemens	2x EOR-D	No	
		Sprecher	2x EOR-D	No	
	IEC103	Basic	3x EOR-D	No	
		ABB	3x EOR-D	No	
		Areva	3x EOR-D	No	
		DB	3x EOR-D	Yes	
		IDS	3x EOR-D	No	
		Mauell	3x EOR-D	No	
		NRM	3x EOR-D	No	

Board	Protocol	SCADA	Devices	Template availability	Note
		SAT	3x EOR-D	No	
		Siemens	3x EOR-D	No	
		Sprecher	3x EOR-D	No	
	IEC103	Basic	PQI-D	No	
		ABB	PQI-D	No	
		Areva	PQI-D	No	
		DB	PQI-D	No	
		IDS	PQI-D	Yes	
		Mauell	PQI-D	No	
		NRM	PQI-D	Yes	
		SAT	PQI-D	No	
		Siemens	PQI-D	No	
		Sprecher	PQI-D	No	
	IEC104	Basic	REG-D	Yes	
		Basic	REG-DP	Yes	
		Basic	REG-D + REG-DP	Yes	
		Basic	EOR-D	Yes	
		Basic	CPR-D	No	
		Basic	REG-DP + EOR-D	No	
		Basic	2x REG-DP	No	
		Basic	3x REG-D	No	
		Basic	8x REG-D	No	
	61850		REG-D(A)	Yes	REG-D(A) Standard Configuration without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Standard Configuration V4.3 With GOOSE
			REG-D(A)	Yes	REG-D(A) V4.3 With GOOSE, File transfer (COLDFIRE)
			REG-D(A) x2	Yes	REG-D(A)x2 without GOOSE V4.3
			REG-D(A)x3	Yes	REG-D(A)x3 without GOOSE V4.3
			REG-D(A) + REG-DP(A)	Yes	REG-D(A) + REG-DP(A) without goose V4.3 /1.6
			REG-D(A) + REG-DP(A)	Yes	REG-D(A) + REG-DP(A) with GOOSE V4.3/1.6
			REG-D(A)x3 + REG-DP(A)	Yes	REG-D(A)x3 + REG-DP(A) with GOOSE V4.3/.16
			REG-D(A)	Yes	REG-D(A) without GOOSE V4.0

Board	Protocol	SCADA	Devices	Template availability	Note
			REG-D(A)	Yes	REG-D(A) without GOOSE V4.1
			REG-DP(A)	Yes	REG-DP(A) without GOOSE V1.6
			REG-DP(A)x2	Yes	REG-DP(A)x2 without GOOSE V1.6
			EOR-D	Yes	EOR-D without GOOSE V4.5
			EOR-D	Yes	EOR-D with GOOSE V4.5
			PQI-D	Yes	PQI-D without GOOSE V2.0
			GDASYS	Yes	GDASYS without GOOSE V2.0
	C37.118	Basic	GDASys	Yes	
	MODBUS	Basic	REG-D	Yes	

If the selected template is not available, the following text appears in the window:

**Template file isn't implemented for chosen combination protocol/SCADA/Eberle devices !**

Other options available in the window:

Table 102: Settings of protocols and templates

Setting	Format	Range	Default	Description
Protocol	-	Selection of values in combo box	DNP3	Selection of transmission protocol
Template edition	-	Selection of values in combo box	Edition 1 for IEC61850 protocol or empty for other protocols	Selection of templates for chosen protocol
SCADA template	-	Selection of values in combo box	Protocol dependent	Selection of templates for chosen protocol
Attached eberle devices	-	Selection of values in combo box	Protocol dependent	Option to select attached Eberle devices, disabled for IEC61850
Transmission mode	-	Selection of values in combo box	balanced	IEC101 specific setting, selection of balanced or unbalanced mode.
Physical medium	-	Selection of values in combo box	RS232	Option to select type of serial interface, available for serial protocols.
Idle state	-	Selection of values in combo box	Non-inverted	Option to select inverted or non-inverted mode in the case when fiber optic serial interface is selected.
Open user-specific file	-	Option box	not selected	Option enables selection of existing XML or INI file with predefined settings
Local path to WinConfig *.xml file	-	Option box	not selected	Option enables selection of WinConfig *.xml file ( <i>Browse</i> button).
Local path to GenReg *.ini file	-	Option box	not selected	Option enables selection of GenReg *.ini file ( <i>Browse</i> button).

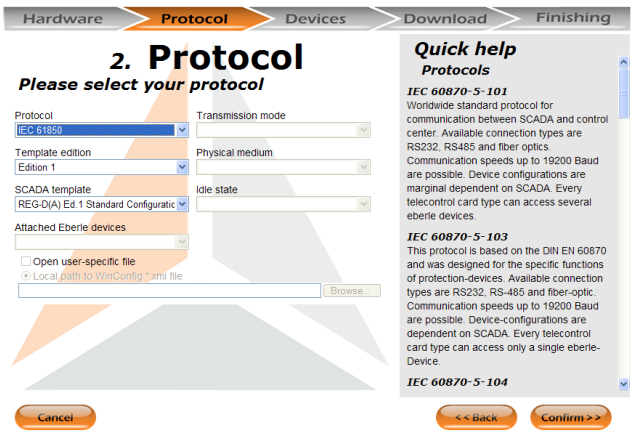


Figure 166: Selection of protocol and templates



## 21.4 Protocol-specific settings

User enters protocol-specific settings step 3. Available controls in step 3 are protocol-dependent so the appearance of this window changes according to the selections of previous steps.

Figure 167: IEC101 settings

Table 103: IEC101 settings

Setting	Format	Range	Default	Description
Link address unstructured	-	1 to 65534	1	Link address as 16-bit number
Link address - structured	-	2x 0 to 255	0, 1	Link address as two 8-bit numbers
ASDU Address unstructured	-	1 to 65534	1	ASDU address as 16-bit number
ASDU Address - structured	-	2x 0 to 255	0, 1	ASDU address as two 8-bit numbers
Enable Originator	-	Option box	not selected	Option to enable originator in IEC101 protocol
Baud rate	-	Selection of values in combo box	19200	Speed of IEC101 serial port

Hardware Protocol Devices Download Finishing

### 3. IEC 60870-5-103

**Please configure your protocol**

Link address: 3

ASDU Address: 3

Baud rate: 19200

Use COM-Server function: ☒

Don't use COM-Server function: ☐

**Quick help**

**Link address**  
The Link address is the device's physical name. Please use this entry to enter the Link address in an unstructured decimal way! In general the Link address is defined by SCADA-engineer. The allowed values are <1-254>.

**ASDU Address**  
You can use this entry to enter the protocol specific ASDU Address (also known as CASDU) in a decimal way. In general the Link address is defined by SCADA-engineer. The allowed values are <1-254>.

**Baud rate**  
The Baud rate defines the data-communication speed. Most common values are 9600 baud and 19200 baud. In general it is defined by SCADA-engineer.

Cancel << Back Confirm >>

Figure 168: Protocol selection, REG-P, IEC103

Table 104: IEC103 settings, REG-P

Setting	Format	Range	Default	Description
Link address	-	1 to 254	1	Link address
ASDU Address	-	1 to 254	1	ASDU address
Baud rate	-	Selection of values in combo box	19200	Speed of IEC103 serial port

Hardware Protocol Devices Download Finishing

### 3. COM-Server

**Please configure your protocol**

Telecontrol board IP settings

IP address: 192.168.56.90

Subnet mask: 255.255.0.0

Gateway: 192.168.1.43

**Quick help**

**IP address**  
The IP-address is the Ethernet based physical name. The IP address always consists of 4 octets (each with values from <0-255>) separated by dots. A common example of a valid IP address would be 192.168.1.51 In general it is defined by SCADA-engineer. The predefined Port of COM-Server is set to 1023.

**Subnet mask**  
The netmask defines how much Nodes are allowed to communicate in a network or a subnetwork. The netmask always consists of 4 octets (each with values from <0-255>) separated by dots. A common example of a valid netmask would be 255.255.0.0 In general it is defined by SCADA-engineer.

**Gateway**  
If a telecontrol board is connected to a subnet and needs to interact with stations outside that subnet, the Gateway defines the IP address of the device connecting with the subnet. Please use this entry to enter the Link address in an unstructured decimal way! In general the Link address is defined by SCADA-engineer. The allowed values are <1-254>.

Cancel << Back Confirm >>

Figure 169: Protocol selection, REG-P, CSO

Table 105: CSO settings, REG-P

Setting	Format	Range	Default	Description
IP address	-	4x 1 to 254	1	IP address of telecontrol board
Netmask	-	4x 1 to 254	1	Network mask of telecontrol board
Gateway	-	Selection of values in combo box	19200	Default gateway of telecontrol board

Hardware Protocol Devices Download Finishing

### 3. DNP3

Please configure your protocol

Baud rate: 9600

Link address of REGSys: 103

Link address of DNP3 master: 1

Use COM-Server function: ☒

Don't use COM-Server function: ☐

**Quick help**

**Baud rate:**  
The Baud rate defines the data-communication speed. Most common values are 9600 baud and 19200 baud. In general it is defined by SCADA-engineer.

**Link address of REGSys**  
The Link address defines the DNP3.0 name of the telecontrol board. This address is defined by SCADA-engineer and is necessary for device identification and communication. Please refer to your SCADA engineer if you do not know the Link address of the telecontrol board.

**Link address of DNP3 master**  
This is the DNP3.0 Link address of the SCADA System which is allowed to communicate with the telecontrol board. Please refer to your SCADA engineer if you do not know the Link address of the SCADA System.

Cancel << Back Confirm >>

Figure 170: Protocol selection, DNP3

Table 106: DNP3 settings

Setting	Format	Range	Default	Description
Baud rate	-	Selection of values in combo box	19200	Baud rate of DNP3 serial port
Link address of REG-x	-	0 to 65535	103	Link address of REG-x
Link address of DNP3 master	-	0 to 65535	103	Link address of DNP3 master

## 21.5 Time synchronization

Time synchronization page appears in the case when the used telecontrol board or protocol enables time synchronization using NTP server. User selects time synchronization either by NTP server or by the used protocol.

Hardware Protocol Devices Download Finishing

### 4. Timesync

Please configure the time synchronization

Time Source: ☒ NTP ☐ Protocol

NTP server IP: 0.0.0.0

2nd NTP Server: 0.0.0.0

**Quick help**

**Time Source**  
The Time Source defines the Source which provides the time synchronization of the communication systems. If the time synchronization shall be done by IEC 60870-5-104 protocol, e.g. the SCADA System, you have to choose the entry IEC. If you have a NTP Server (Network Time Protocol Server) inside your network you also can choose the NTP entry. Note that you have to define the NTP Server-IP if you want to use that kind of time-synchronization.

**NTP Server-IP**  
The NTP Server-IP defines the Ethernet address of the NTP Server. In general you can ask your SCADA-engineer for information on the IP address of NTP Server.

**2nd NTP Server**  
Use this entry to define a second NTP Server. If you do not have a second NTP Server, you can leave this entry unchanged.

Cancel << Back Confirm >>

Figure 171: Time synchronization

Table 107: Time synchronization

Setting	Format	Range	Default	Description
---------	--------	-------	---------	-------------

Setting	Format	Range	Default	Description
Time Source	-	Option box	NTP	Selection of time source
NTP server IP	-	4x 1 to 254	0.0.0.0	IP address of NTP server
2nd NTP Server	-	4x 1 to 254	0.0.0.0	IP address of second alternative NTP server

## 21.6 Devices

*Devices* step displays devices contained in the settings. User can modify configuration by un-checking the individual device via the *Enabled* Check-box option. User can also change identifiers of individual devices by the *Identifier* textbox.

Nr.	Enabled	Device	Identifier
#1	<input checked="" type="checkbox"/>	REG-D	AA:
#2	<input type="checkbox"/>		
#3	<input type="checkbox"/>		
#4	<input type="checkbox"/>		
#5	<input type="checkbox"/>		
#6	<input type="checkbox"/>		
#7	<input type="checkbox"/>		
#8	<input type="checkbox"/>		

**Quick help**

**Enable**  
With the enable-checkbox you can disable one or more devices of a former selected template. E.g. if you have 6 Eberle-devices to be connected to a REG-PE and there is no template with a fitting number of Eberle-devices, you are able to choose an 6 Device-template and deselect two of them all.

**Device**  
The Devices column is a read only section. This should create the binding between the device-number and the device-type. This allows the binding of Device-type and Device-ID.

**Identifier**  
The Identifier is the internal name of the Eberle-device connected to the telecontrol board. Whenever several devices are connected to a single communication hardware, each Eberle-device needs a unique Identifier. The Identifier always consists of a leading capital letter, an

Figure 172: Devices

## 21.7 REGSys configuration

*REGSys configuration* step refers to the necessity of equal setting of communication configuration between telecontrol board and device. User has to modify the device communication settings to match the given settings of telecontrol board. The *HANDSHAKE* value reflects the version of telecontrol board.

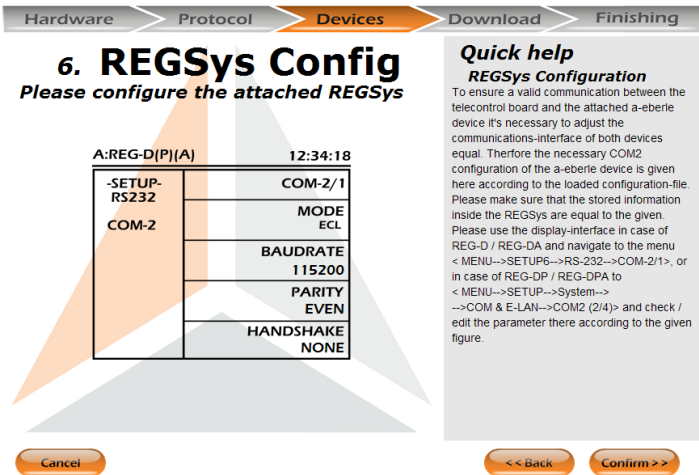


Figure 173: REGSys configuration

## 21.8 Download

*Download* step is intended for transfer of created settings and corresponding firmware to the telecontrol board. The appearance of the *Download* page differs according to the available data transfer possibilities of individual board and necessary settings.

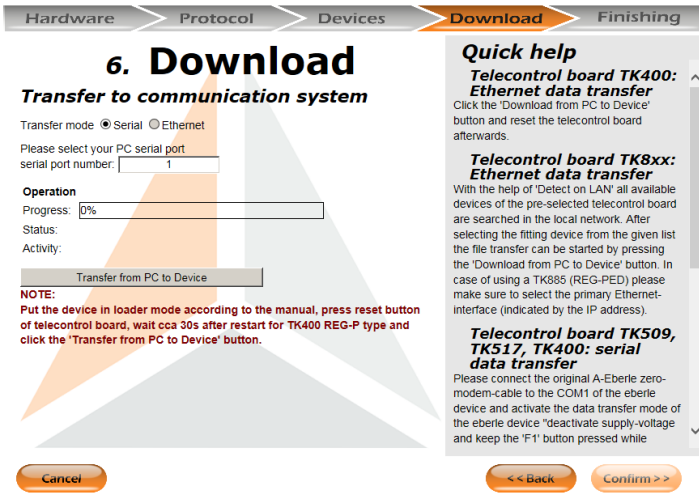


Figure 174: Download (REG-P)

Functionality and user actions of data transfer of settings and firmware to REG-P telecontrol board are similar to *Manual* data transfer which can be found in *Advanced* mode as described in chapter 8.2.4.

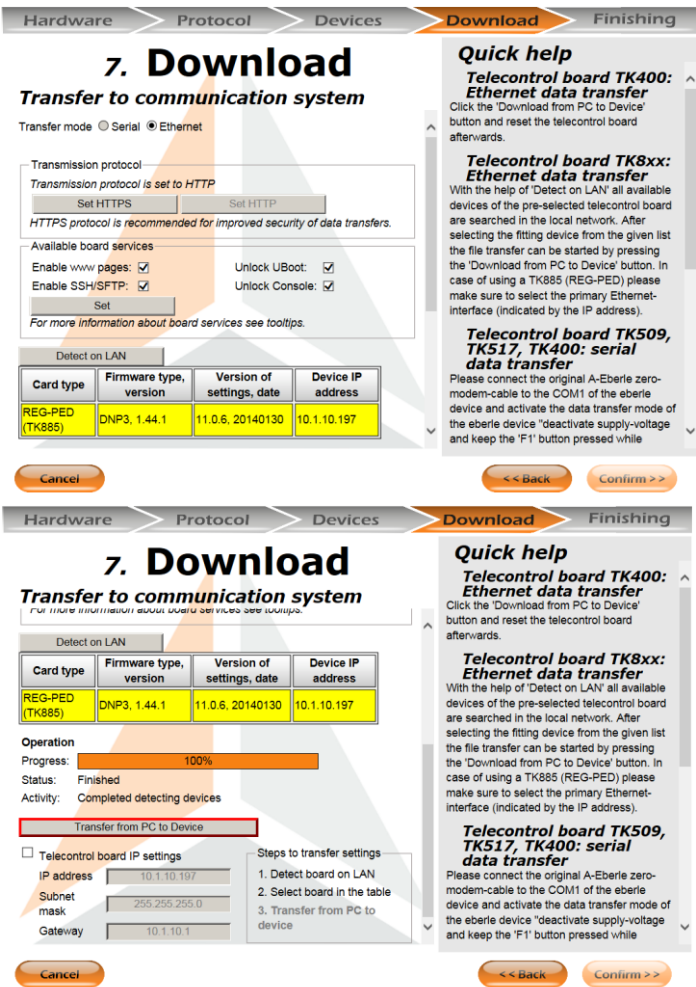


Figure 175: Download (REG-PE(D))

Functionality and user actions of data transfer of settings and firmware to REG-PE(D) tele-control board are similar to *Remote* data transfer which can be found in *Advanced* mode as described in chapter 8.2.4. User detects the board in the network first to get the board settings and then selects the chosen board in the table. *Confirm* button is enabled after transfer.

## 21.9 Finishing

The last step allows the user to save their newly created settings into the WinConfig .XML file that can be processed by WinConfig in *Advanced* mode and/or for exporting the settings to the .XLS file.

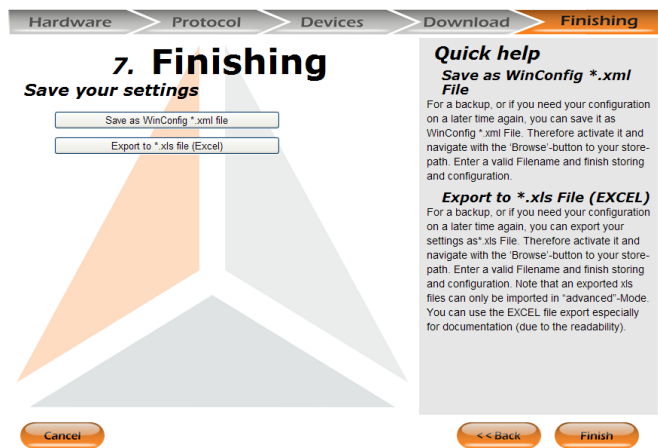



Figure 176: Finishing

## 22. Tips on Troubleshooting

The subject of this chapter is for providing tips on troubleshooting with the REG-PE / REG-PED device.

Firstly, here are the essential points necessary to ensure correct operation.



**DANGER**

Only qualified personnel should work on this equipment, and only after becoming thoroughly familiar with all warnings and safety notices of this and the associated manuals, as well as with the applicable safety regulations.

### 22.1 Common troubleshooting tips

	<ul style="list-style-type: none"><li>●</li></ul>
IP address	<ul style="list-style-type: none"><li>● Has an IP address been set in the device? If this setting has not been made, it will not be possible to establish a link. To validate the IP address, it is possible to execute a ping from the network to the device's IP address using a Ping function on the Command line.</li></ul>
Subnet mask	<ul style="list-style-type: none"><li>● Has the subnet mask been correctly set? The subnet mask results from the addressing scheme used in the network segment.</li></ul>
Remote access not possible	<ul style="list-style-type: none"><li>● Has the gateway address been correctly set in the device? If it is not correct, it will not be possible to access a device via two or more networks.</li></ul>
No time synchronization via NTP	<ul style="list-style-type: none"><li>● Is there at least one timeserver in the network and what is its address?</li><li>● Has the timeserver's address been correctly set in the NTP-setting of REG-PE / REG-PED device?</li><li>● Is the device correctly parameterized for use of time synchronization via Ethernet?</li><li>● If the timeserver is a PC, are the Windows time service deactivated and the correct NTP service started?</li></ul>
You can't save a data to jffs2.tar	<ul style="list-style-type: none"><li>● Do you have permission to store the file or does the path of your file contain illegal characters?</li></ul>
You can't restore a	<ul style="list-style-type: none"><li>● Do you have permission to the working file and directory?</li></ul>

## 22.2 Diagnostic Functions in the Context of the REG-P / REG-PE / REG-PED Device

The subject of this section is troubleshooting problems with the settings of REG-PE / REG-PED device and XXXSys™-Device interconnection.

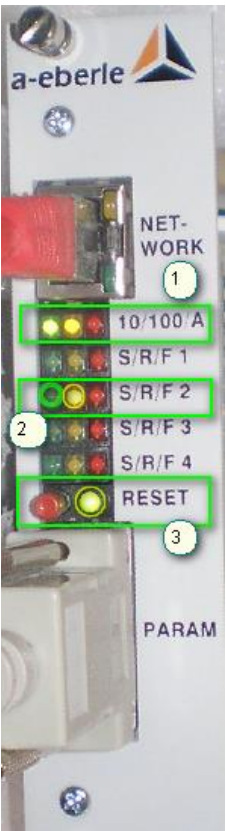
Table 108: Diagnostic functions in the context of the device

LED's status of REG-PE/  
REG-PED device

Indication

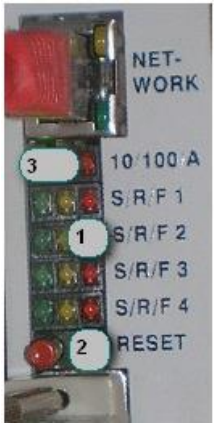
Normal operation:

1. Indication of Ethernet activity, depends on current activity on Ethernet line
2. Indication of communication on serial ports 1 to 4 (S – send data, R – receive data, F - error)
3. Watchdog indication



Hardware or application fault.

- First of all check please network connection and power supply.
- Then follow the instructions described above.







Communication REG-PE – REG-D™ faults.

1. Check please device settings
2. Check communication settings of REGSys™ (baud rate, parity etc.)

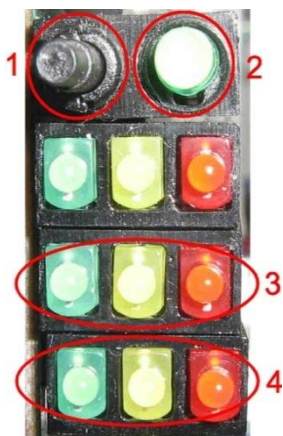


**Note:**

If the problems persist, please ask your system administrator first. For further assistance please contact a.eberle product support at

<http://www.a-eberle.de>

**LED's status of REG-P  
version TK400 board**



**Indication**

Normal operation:

1. Reset button
2. Indication of watchdog or COM-Server running
3. Indication of transmit, receive and error in communication between REG-P and external device using the topical protocol
4. Indication of transmit, receive and error in internal communication between REG-P and a.eberle device

All LEDs blinking – invalid combination of firmware and settings



Ethernet booter operation:

1. Ethernet booter is waiting for connection (LEDs alternately blinking)
2. Ethernet booter finished data transfer and stores data in the internal memory

“Running light” indicates data transfer



Serial booter operation:

- Serial booter is waiting for connection.

**LED's status of REG-P  
version TK517 board**



**Indication**

Normal operation:

1. Indication of transmit, receive and error in communication between REG-P and external device using the topical protocol
2. Indication of transmit, receive and error in internal communication between REG-P and a.eberle device
3. Indication of power supply voltage and running watchdog

All LEDs blinking – invalid combination of firmware and settings.



Parallel booter operation:

- Parallel booter for data transfer via parallel Param port is running. This way of data transfer is not supported by WinConfig.






- Serial booter operation:
- Serial booter is running. Alternate blinking of some LEDs indicates data transfer.

23.      **Related Documentation**

Document	Author
"REG-PE Firmware Update IEC61850.v1.2.doc"	a-Eberle
"REG-PE Quick Guide for technicians IEC61850 1.2.doc"	a-Eberle
"REG-PE User Management IEC61850.v1.4.doc"	a-Eberle
Installation instructions COM-Server functionality of PQI-DA.doc	a-Eberle
PQI-DA_loader_mode.MOV	a-Eberle

## 24. Maintenance/Cleaning

This unit is maintenance-free for customers.

 <b>DANGER</b>	<p><b>Danger of electric shock!</b></p> <ul style="list-style-type: none"><li> Do not open the unit.</li><li> Maintenance of the equipment can only be carried out by A-Eberle.</li></ul>
--	---

For service, contact A-Eberle.

**Service address:**

A. Eberle GmbH & Co. KG

Frankenstraße 160

D-90461 Nuremberg

## 25. Disposal

To dispose of the device and its accessories, send all components to A-Eberle.

## 26. Product Warranty

A-Eberle guarantees that this product and accessories will remain free of defects in material and workmanship for a period of three years from the date of purchase. This warranty does not cover damage caused by accident, misuse or abnormal operating conditions.

To obtain service during the warranty period, please contact A-Eberle GmbH & Co KG in Nuremberg.

## 27. List of Figures

Figure 1:	The RPL window .....	17
Figure 2:	Introductory window .....	26
Figure 3:	Settings tree .....	27
Figure 4:	Main menu buttons .....	28
Figure 5:	Add new settings.....	29
Figure 6:	Open settings .....	30
Figure 7:	Remote transfer from PC, REG-P .....	34
Figure 8:	Manual transfer from PC .....	35
Figure 9:	Transfer from PC for telecontrol boards type REG-PE(D) .....	36
Figure 10:	Transfer settings to PC.....	39
Figure 11:	REG-PE(D) board IP settings.....	40
Figure 12:	REG-PE(D) board certificates .....	42
Figure 13:	Compare settings .....	44
Figure 14:	Import settings.....	45
Figure 15:	Missing/incorrect values .....	46
Figure 16:	IEC101 basic settings.....	47
Figure 17:	Settings – SCADA, IEC101 REG-P .....	49
Figure 18:	Balanced mode settings.....	51
Figure 19:	Settings – SCADA, IEC101 REG-PE(D) .....	53
Figure 20:	TK400 ComServer settings .....	55
Figure 21:	Linked Devices.....	56
Figure 22:	Time synchronization settings .....	57
Figure 23:	Internal communication, IEC101 for REG-P .....	58
Figure 24:	Converter errors.....	60
Figure 25:	Device request settings.....	60
Figure 26:	IEC101 device request settings for REG-PE(D).....	61
Figure 27:	Indications.....	62
Figure 28:	IEC101 Indications for REG-PE(D).....	63
Figure 29:	IEC101 Commands .....	65
Figure 30:	IEC101 Commands .....	66
Figure 31:	IEC101 Commands REG-PE(D).....	66
Figure 32:	Editing the IOA bytes in entire columns .....	67
Figure 33:	Status bits.....	69
Figure 34:	IEC103 specific settings.....	71
Figure 35:	IEC103 converter errors .....	73
Figure 36:	IEC103 device request settings .....	73
Figure 37:	IEC103 basic settings REG-PE(D) .....	79
Figure 38:	IEC103 settings SCADA for PQI-D.....	81
Figure 39:	IEC103 settings SCADA for EOR-D .....	85
Figure 40:	Receiving Online-Data from PQI-D per shared channel COM-Server .....	87
Figure 41:	Online data Overview via REG-PE(D) COM-Server ComServer .....	88

Figure 42:	Online graphic disturbance data from PQI-D .....	88
Figure 43:	IEC103 advanced settings PQI-D – ComServer.....	89
Figure 44:	ComServer settings, EOR-D .....	93
Figure 45:	Supervisory settings, REG-PE(D).....	96
Figure 46:	IEC103 Devices, Time synchronization settings, PQI-D .....	98
Figure 47:	IEC103 Devices, Time synchronization settings, EOR-D .....	99
Figure 48:	IEC103 Internal communication, PQI-D .....	100
Figure 49:	IEC103 Devices, EOR-D, Internal communication .....	102
Figure 50:	IEC103 Device x, PQI-D .....	104
Figure 51:	IEC103 Device x, Device settings EOR-D.....	105
Figure 52:	IEC103 Device x, Indications, PQI-D .....	107
Figure 53:	IEC103 Device x, Indications, EOR-D .....	109
Figure 54:	IEC103 Device x, Commands .....	110
Figure 55:	IEC103 Device x, Fault records, EOR-D .....	111
Figure 56:	Read Faults Record from EOR-D.....	112
Figure 57:	IEC104 basic settings .....	116
Figure 58:	IEC104 Settings - SCADA.....	118
Figure 59:	IEC104 ComServer settings .....	120
Figure 60:	IEC104 Supervisory settings .....	123
Figure 61:	IEC104 Linked devices .....	125
Figure 62:	IEC104 time synchronization settings .....	125
Figure 63:	Internal communication settings .....	126
Figure 64:	IEC104 commands.....	127
Figure 65:	IEC104 indications .....	128
Figure 66:	DNP3 basic settings REG-P .....	131
Figure 67:	Advanced Settings - SCADA for REG-P (TK509, TK400) .....	132
Figure 68:	Advanced Settings - SCADA for REG-P (TK517) .....	134
Figure 69:	DNP3 device request settings REG-P.....	136
Figure 70:	DNP3 commands REG-P .....	137
Figure 71:	DNP3 indications REG-P .....	138
Figure 72:	DNP3 basic settings REG-PE(D) .....	139
Figure 73:	Advanced settings SCADA REG-PE(D).....	140
Figure 74:	DNP3 device request settings REG-PE(D).....	142
Figure 75:	DNP3 indications REG-PE(D) .....	143
Figure 76:	DNP3 commands REG-PE(D) .....	145
Figure 77:	CSO settings REG-P.....	146
Figure 78:	CSO channels REG-PE(D) .....	148
Figure 79:	CSO channels REG-PE(D) .....	150
Figure 80:	MODBUS RTU basic settings .....	151
Figure 81:	Modbus TCP basic settings.....	152
Figure 82:	MODBUS SCADA settings .....	153
Figure 83:	Device internal communication settings.....	155
Figure 84:	MODBUS device request settings .....	156

Figure 85:	MODBUS indications.....	157
Figure 86:	MODBUS commands.....	158
Figure 87:	C37.118 basic settings.....	159
Figure 88:	C37.118 Serial Port Assignment.....	160
Figure 89:	C37.118 SCADA Settings .....	161
Figure 90:	C37.118 ComServer Settings.....	162
Figure 91:	C37.118 Supervisory settings.....	165
Figure 92:	C37.118 Linked Devices .....	167
Figure 93:	C37.118 Time Synchronization .....	168
Figure 94:	C37.118 Internal communication .....	169
Figure 95:	C37.118 Device x.....	170
Figure 96:	C37.118 Indications.....	171
Figure 97:	Product (IED) Model.....	172
Figure 98:	SCADA Settings.....	173
Figure 99:	Execute SCL_Config engineering Tool.....	173
Figure 100:	Displaying the project configuration .....	174
Figure 101:	Displaying the properties of nodes.....	174
Figure 102:	Displaying the ICD file.....	175
Figure 103:	Adding and deleting devices.....	176
Figure 104:	Renaming device.....	176
Figure 105:	Adding, deleting and renaming logical nodes .....	177
Figure 106:	Editing sAddr.....	178
Figure 107:	Removing Data Objects .....	184
Figure 108:	Restore Data Objects from template .....	184
Figure 109:	Renaming the Data Objects.....	185
Figure 110:	Confirmation to rename DO list .....	185
Figure 111:	Changing of DO Data Class .....	186
Figure 112:	Changing the control model for controllable data objects .....	187
Figure 113:	New attributes for selected “sbo” control model .....	188
Figure 114:	Excluded attributes for selected “direct” control model .....	188
Figure 115:	GOOSE settings page .....	189
Figure 116:	GOOSE Control Blocks list.....	190
Figure 117:	Parameters for the new GOOSE Control Block.....	190
Figure 118:	Common settings of the GOOSE Control Block .....	191
Figure 119:	Communication settings of the GOOSE Control Block .....	191
Figure 120:	Data Set of the GOOSE Control Block.....	191
Figure 121:	Adding the Data Object to Data Set of GOOSE Control Block .....	192
Figure 122:	Adding the Data Object to Data Set of GOOSE Control Block .....	192
Figure 123:	Adding structure “valWTr” to Data Set of GOOSE Control Block .....	192
Figure 124:	External Publishers List.....	193
Figure 125:	Adding and deleting Subscribers and Data Objects.....	193
Figure 126:	Adding Subscribers and Data Objects from ICD-file .....	194
Figure 127:	External Publisher Settings.....	195



Figure 128:	External Dataset Object Settings .....	196
Figure 129:	Actions log.....	197
Figure 130:	IED Server Description .....	197
Figure 131:	Logical Node Configuration.....	198
Figure 132:	Status Data mapped in device data .....	199
Figure 133:	Status Data Point not mapped in device data. ....	199
Figure 134:	Example of DPS-complex status.....	202
Figure 135:	Control Value Configuration (Single Command).....	204
Figure 136:	Control Value Configurations (Multi Command) .....	210
Figure 137:	Executing Command Pre-Conditions .....	211
Figure 138:	Condition Type (behavior) .....	211
Figure 139:	Condition extended Settings.....	212
Figure 140:	Acknowledgement Condition Settings.....	212
Figure 141:	ACK-NACK test behavior .....	213
Figure 142:	Control Model Parameter.....	213
Figure 143:	Set point Value Configuration (only with Single Command) .....	214
Figure 144:	GOOSE light Control Blocks Configuration.....	215
Figure 145:	Capture fragment of GOOSE light telegram .....	216
Figure 146:	GOOSE light Input architecture.....	217
Figure 147:	Publisher and Subscriber sides .....	218
Figure 148:	"Common Options" Tab.....	218
Figure 149:	GOOSE Retransmission Settings Tab .....	219
Figure 150:	GOOSE lightSubscribers pane .....	222
Figure 151:	Add Subscriber from other ICD file .....	223
Figure 152:	List of GOOSE lightexternal Input Objects .....	225
Figure 153:	External GOOSE lightobject configuration.....	226
Figure 154:	IEC61850 Basic Settings .....	231
Figure 155:	IEC61850 Serial Ports Settings .....	233
Figure 156:	IEC61850 Settings - SCADA .....	235
Figure 157:	ELAN extension over Ethernet (CSE).....	237
Figure 158:	IEC61850 - COM-Server .....	240
Figure 159:	IEC61850 - COM-Server Extended .....	240
Figure 160:	IEC61850 Supervisory settings.....	243
Figure 161:	IEC61850 Time synchronization.....	246
Figure 162:	IEC61850 Internal communication .....	249
Figure 163:	IEC61850 Device x.....	251
Figure 164:	Saving of settings in IEC61850 .....	252
Figure 165:	Selection of hardware.....	254
Figure 166:	Selection of protocol and templates .....	264
Figure 167:	IEC101 settings.....	265
Figure 168:	Protocol selection, REG-P, IEC103 .....	266
Figure 169:	Protocol selection, REG-P, CSO .....	266
Figure 170:	Protocol selection, DNP3 .....	267



Figure 171:	Time synchronization .....	267
Figure 172:	Devices.....	268
Figure 173:	REGSys configuration.....	269
Figure 174:	Download (REG-P) .....	269
Figure 175:	Download (REG-PE(D)).....	270
Figure 176:	Finishing.....	271

## 28. List of Tables

Table 1:	Topical software state at the 2012-10-10.....	11
Table 2:	IEC101 basic settings.....	48
Table 3:	Settings – SCADA, IEC101 REG-P .....	50
Table 4:	IEC101 balanced mode settings .....	52
Table 5:	IEC101 REG-PE(D) Settings – SCADA, interface settings .....	54
Table 6:	IEC101 REG-PE(D) Settings – SCADA, protocol settings .....	54
Table 7:	TK400 COM-Server settings .....	55
Table 8:	Internal communication.....	59
Table 9:	IEC101 device settings .....	60
Table 10:	IEC101 device settings for REG-PE(D) .....	61
Table 11:	IEC101 indications.....	62
Table 12:	IEC101 indications.....	64
Table 13:	IEC101 Commands .....	65
Table 14:	IEC101 Commands .....	66
Table 15:	IEC101 Commands REG-PE(D).....	66
Table 16:	Meaning of Status bits .....	70
Table 17:	IEC103 settings.....	72
Table 18:	IEC103 device settings .....	74
Table 19:	IEC103 basic settings REG-PE(D) .....	80
Table 20:	IEC103 settings SCADA PQI-D.....	82
Table 21:	IEC103 settings SCADA for EOR-D .....	86
Table 22:	IEC103 ComServer settings PQI-D.....	89
Table 23:	IEC103 ComServer settings PQI-D, Channels .....	91
Table 24:	IEC103 ComServer settings EOR-D.....	93
Table 25:	IEC103 Supervisory settings.....	97
Table 26:	IEC103 Devices, Time synchronization settings, PQI-D.....	98
Table 27:	IEC103 Devices, Time synchronization settings, EOR-D.....	99
Table 28:	IEC103 Internal communication, PQI-D .....	100
Table 29:	IEC103 Devices, EOR-D, Communication settings.....	103
Table 30:	IEC103 Device x, Device settings PQI-D .....	105
Table 31:	IEC103 Device x, Device settings EOR-D .....	106

Table 32:	IEC103 Device x, Indications, PQI-D .....	107
Table 33:	IEC103 Device x, Data points – indications, EOR-D .....	109
Table 34:	IEC103 Device x, Data points – commands .....	110
Table 35:	IEC103 Device x, Fault records, EOR-D .....	111
Table 36:	Channel offset term .....	114
Table 37:	IEC104 settings .....	117
Table 38:	IEC104 settings - SCADA .....	119
Table 39:	IEC104 ComServer settings .....	120
Table 40:	IEC104 Supervisory settings .....	124
Table 41:	IEC104 time synchronization .....	126
Table 42:	IEC104 Device communication settings .....	126
Table 43:	IEC104 commands .....	127
Table 44:	IEC104 indications .....	128
Table 45:	DNP3 basic settings REG-P .....	131
Table 46:	DNP3 Settings - SCADA REG-P (TK509, TK400) .....	133
Table 47:	DNP3 Settings - SCADA REG-P (TK517) .....	135
Table 48:	DNP3 device settings REG-P .....	136
Table 49:	DNP3 commands REG-P .....	137
Table 50:	DNP3 indications REG-P .....	138
Table 51:	DNP3 basic settings REG-PE(D) .....	139
Table 52:	DNP3 advanced settings REG-PE(D) .....	141
Table 53:	DNP3 device settings REG-PE(D) .....	142
Table 54:	DNP3 indications REG-PE(D) .....	143
Table 55:	DNP3 commands REG-PE(D) .....	145
Table 56:	CSO settings REG-P .....	147
Table 57:	CSO settings REG-PE(D) - Channels .....	148
Table 58:	CSO Supervisory settings .....	150
Table 59:	MODBUS basic settings .....	151
Table 60:	MODBUS TCP basic settings .....	152
Table 61:	MODBUS advanced settings .....	154
Table 62:	Device communication settings for MODBUS .....	155
Table 63:	MODBUS device settings .....	156
Table 64:	MODBUS indications .....	157
Table 65:	MODBUS Commands .....	158
Table 66:	C37.118 basic settings .....	159
Table 67:	C37.118 Serial Ports Settings .....	160
Table 68:	C37.118 SCADA Settings .....	161
Table 69:	C37.118 ComServer Settings .....	162
Table 70:	C37.118 Supervisory settings .....	166
Table 71:	C37.118 Linked Devices .....	167
Table 72:	C37.118 Time synchronization .....	168
Table 73:	C37.118 Internal communication .....	169
Table 74:	C37.118 Device Request Settings .....	170

Table 75:	C37.118 Indications.....	171
Table 76:	Status Data Configuration Data .....	200
Table 77:	Keyword group for definition the position in poll-string:.....	200
Table 78:	Keyword group for event type definition: .....	201
Table 79:	Keyword group for definition the directed-behavior in directional protection activation information (ACD).....	201
Table 80:	Keywords group for definition complex data object behavior .....	201
Table 81:	Control value settings .....	204
Table 82:	Boolean conversion rules for <i>[command] [convert (ctlVal)]</i> .....	206
Table 83:	Double Point conversion rules for <i>[command][convert(ctlVal)]</i> .....	209
Table 84:	Multi command control value settings .....	210
Table 85:	Predicable Condition Extended Settings.....	212
Table 86:	Single command Set point settings.....	214
Table 87:	Settings of GOOSE <i>light</i> .....	219
Table 88:	GOOSE subscribed stream settings.....	224
Table 89:	External GOOSE <i>lightobject</i> settings.....	226
Table 90:	Boolean conversion rules for GOOSE command .....	229
Table 91:	Double Point conversion rules for GOOSE command.....	229
Table 92:	IEC61850 Basic Settings .....	232
Table 93:	IEC61850 Serial Ports Settings .....	233
Table 94:	IEC61850 Settings - SCADA .....	235
Table 95:	ELAN extension over Ethernet (CSE).....	238
Table 96:	IEC61850 - COM-Server.....	241
Table 97:	IEC61850 Supervisory settings.....	244
Table 98:	IEC61850 Time synchronization.....	247
Table 99:	IEC61850 Internal communication .....	250
Table 100:	IEC61850 Device x.....	252
Table 101:	Protocols and templates.....	255
Table 102:	Settings of protocols and templates.....	263
Table 103:	IEC101 settings .....	265
Table 104:	IEC103 settings, REG-P.....	266
Table 105:	CSO settings, REG-P .....	266
Table 106:	DNP3 settings .....	267
Table 107:	Time synchronization .....	267
Table 108:	Diagnostic functions in the context of the device .....	272

We take care of it.

---

## Notes

[illegible]

We take care of it.

[illegible]



A. Eberle GmbH & Co. KG

Frankenstraße 160  
D-90461 Nuremberg  
Germany

Tel.: +49 (0) 911 / 62 81 08-0  
Fax: +49 (0) 911 / 62 81 08 96  
E-Mail: [info@a-eberle.de](mailto:info@a-eberle.de)

<http://www.a-eberle.de>

**Software - Version:**

Version: 11.0.6

---

Creation Date: 2008-02-15

Release Date: 2015-08-06

**Copyright 2015 by A. Eberle GmbH & Co. KG**

Subject to change without prior notice.